Automotive Service Digest

Our 47th year May, 1959

Only cleanliness permits precision. See page 16.

WINNING COMBINATION!

. . . Jimmy Bryan and Perfect Circles!

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Take a top driver like Jimmy Bryan, team him up with a Doctor of Motors like George Salih, add a set of Perfect Circle Chrome piston rings for power protection, and you've got a great winning combination!

Leading race car mechanics install Perfect Circle Chrome rings *because they deliver the ultimate in performance.* These mechanics know that Perfect Circle engineering and research create 2-in-1 sets tailored for top performance in each make and model engine.

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Champions are engineered for every car made by Ford, General Motors, Chrysler, American Motors, Studebaker-Packard, and every major foreign maker

your profits...

"Here's the place for expert service!"

"MECHANIC ON DUTY" sign from your regular Champion supplier for only $7.50 with an order for any 50 Champion Spark Plugs.

More service business naturally means more parts business, too. And the more cars you bring in, the more gas you sell!

So put this new Champion sign to work for you right now! Check to see which fast-moving Champion types you are low on – and then call your Champion supplier with your order – today! With your new Champion curb sign at work – you're going to need more Champion Spark Plugs!

Half of the cars on the road need new spark plugs. A "one-plug check" with Champion's new "Check-A-Plug" card is a fast, efficient way to go after this business. Get this free sales-aid from your Champion supplier – and check one plug on every car!

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SHERLOCK McKANICK and MIKE

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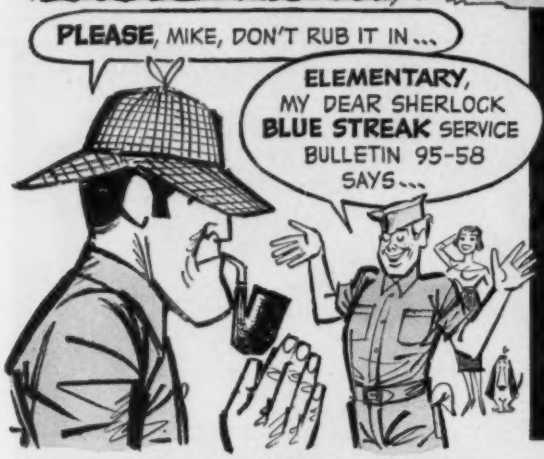
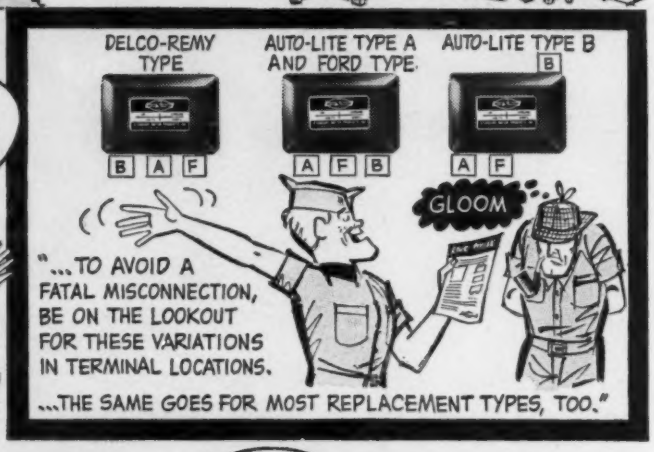
MOST EMBARRASSING, MIKE! I ALMOST KILLED THIS VOLTAGE REGULATOR WITH MY OWN HANDS!
CHEER UP, SHERLOCK. IT CAN HAPPEN TO ANYONE WHO DOESN'T REMEMBER THAT THERE ARE THREE BASIC DIFFERENT TERMINAL ARRANGEMENTS

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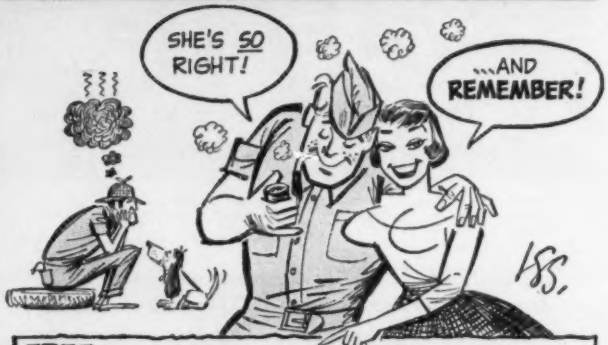

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May 1959

Automotive Service Digest

Cover Subject

Clean wiping rags are indispensable to precision repair work. Having them handy at strategic locations is a sound way to promote neatness throughout the shop. Photo courtesy Sanitary Institute of America.

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Technical help for the service shop

Tech Know-How **articles cover how-to and what's new in approved, up-to-date shop practices, as seen and understood by men experienced in the trade.** ***Business Know-How,*** **the dollar-sign side of automotive service work;** ***Service Education,*** **the who-what-where-how of today's trade training.**

SYMBOLIZES A.S.D. "TECH KNOW-HOW" FEATURE ARTICLES

LEARN MORE EARN MORE
A S D
SERVICE EDUCATION

SYMBOLIZES A.S.D. "BUSINESS KNOW-HOW" ARTICLES

BY HERB CARRIER
Detroit Editor

Spokes from the "hub"

• PRE-LUBED COMPONENTS are beginning to show up in standard production U.S. passenger cars. The latest announced is American Motors' new steering linkage ball joints, which are being installed as a running change on all Rambler Rebel V-8 models.

R. H. Isbrandt, director of automotive engineering of American Motors Corp., explained the new bearings as "ball joints with nylon bushings, which are permanently lubricated and 'sealed for life'." They will be standard equipment on all '60 Rambler models.

★ ★ ★

Fading fittings might be good news to car owners who hate spending a dollar every month or so for a lube job, but they can be not-so-good news to persons who make their living selling and servicing cars.

For example, the list of pre-lubed components now includes such things as water pumps, some universal joints, driveshaft bearings, ball joints, and wheel bearings.

A recent survey revealed a number of premature failures of both ball and roller-type front wheel bearings that are promoted as "lubricated for life." "For life" covers a long, long, time. Just what is normal life expectancy for original equipment front wheel bearings? Certainly, quality bearings should last at least 30,000 miles or more. Does this mean that the bearings are guaranteed for 30,000 miles? Seems so.

Legal eagles have warned that lawsuits are a threat even after many months—or years—of ownership if the car owner can prove that the accident was caused by front wheel bearings that failed before their normal life span . . . even if the owner hadn't spent a dime for bearing maintenance for 30, 50, or 70,000 miles!

Some mechanics and garage owners are insisting that the front wheel bearings be lubricated regardless of what the car manufacturer says. This is a hard sell. A few car buyers—about 20 per cent—actually read their Owner's Manuals. When the book says the bearings never require lubrication, and their favorite knuckle-buster tries to talk them into a bearing repack, somebody's reputation is about to be torn down. Either the manufacturer doesn't know what he is talking about, or the mechanic is trying to push unnecessary service. It's a tough deal, and with the introduction of more and more pre-lubed components, the stage may be set for some interesting battles in the field of Jurisprudence.

★ ★ ★

Small car scoop straight from the mahogany table. The stockholders of Crosley Radio Corp. met to consider a proposed amendment to their incorporation articles. It's rumored that the majority voted "aye" for the corporation's entrance into the automotive field with a light car. It was generally agreed that the car buying public was in just the right mood for such a product. The time of this decision? **1938.**

★ ★ ★

Latest small car rumor says that Chevrolet's engine for its small car has stood up under 1500 continuous hours of operation at wide open throttle. To this startling "scoop," other rumor peddlers have added the comment, "Why shouldn't it? It's a dead ringer for the Volkswagen engine. In fact, the VW people helped build it."

★ ★ ★

Ford's moving very quickly in developing a gas turbine engine that very likely could appear in test cars and trucks by the end of the current model year. The "704," Ford's name for its dual burner turbine, is reportedly rated at 300 horsepower, but measures only 32 inches long, 29 inches wide, 28 inches high.

Small enough to fit comfortably under the hood of practically any mass produced American passenger car. In addition to operating equally well with unleaded gasoline, diesel fuel, kerosene, or jet engine fuel, the "704" compares favorably with diesel engines in fuel consumption and is superior to gasoline engines under most every operating condition.

★ ★ ★

Forced mechanic training took place when Art Linkletter, TV star of **People Are Funny**, presented Don Maxwell with a brand new 1959 Plymouth Custom Suburban. Don's a 16 year old student with a yen for automotive mechanics.

He was forced into an accelerated course of study because the car was given with a few strings attached. The engine was delivered in a box—and completely unassembled! In order to keep the car, Don had to build up the engine from scratch.

This could be an excellent way of easing the mechanic shortage. Very few cases where such incentives were offered are on record.

★ ★ ★

Sidewalk superintendents are good for business. At least, so says Robert W. Johnson, service manager of Darby Buick in Sarasota, Florida. According to Johnson, "Customers get inquisitive and get their hands dirty sometimes, but they feel better because they have inspected the part that has been replaced and seen what they paid for."

Johnson also says this personal contact with the mechanic generates extra business from owners, who request additional service after seeing it performed on someone else's car. "Three customers requested that their wheels be balanced after watching it done on another car," he said.

So far this year, customer labor sales at Darby Buick have increased more than 21 per cent, and parts sales are up nearly 18 per cent, as a result of this "open door" policy.

Maybe those mechanics and service managers who fight to keep the customer out of the service department are missing a good bet. Writing the initial repair order, then shooing the customer out of the shop, may not be good business—especially if the customer would rather stick around while the repairs are being made. Certainly, it's better to have the customer on tap should any additional repair work become necessary in the course of doing the original job. After all, a customer in the shop is worth two on the telephone.

Lookum for Instant Oil Control?

Try AMERICAN HAMMERED KROME-OIL

with Stainless Steel Oil Rings

American Hammered stainless steel oil rings come in fast—stop smoking, control oil in tapered and out-of-round bores. New design is the reason why.

These stainless steel oil rings are self-expanding. They hold their fit in the cylinder bore because of their new end-abutment design. (See illustration below.) Also because stainless steel retains its original, built-in tension throughout the life of the ring. Stainless steel ring life, incidentally, is twice that of rings made of other metals.

Stainless steel oil rings are matched with pre-seated, chrome plated compression rings. Both seat instantly.

Try Krome-Oil on your next job, new or older model, regardless of cylinder condition. Krome-Oil sets don't fail. No comebacks. Try just one set and you'll see.

Illustration above shows a stainless steel oil ring compressed in the cylinder bore. The correctly engineered number of spring tension points provide the most uniform outward pressure ever attained—and without any back-up springs or shims (see arrow No. 1).

An equal number of sturdy shoulders supporting each steel rail produce complete contact with the cylinder wall (see arrow No. 2).

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Automotive Replacement Division
MUSKEGON, MICHIGAN
A Division of Sealed Power Corporation

Instrument corner

Conducted by The Instrument Man In the interests of simpler, faster, more satisfactory—and more profitable—service operations.

• WHEN THE DOORBELL announced the arrival of evening guests at the Instrument Man's home, the event was no novelty. Jim often sat around the house at night shooting the breeze with "his boys." It gave him a chance to pass along many bits of information he picked up on his regular rounds, and so help improve service work generally. This time it was Tom and Bill, good friends as well as customers.

The Stumbling Cab

After the preliminary remarks about the weather, Bill got down to the first puzzling case of the session:

"Had an odd one today. It started a couple weeks ago on a cab I've been servicing right along."

The owner had been having trouble with distributor points burning out. Being mechanically inclined, he'd put in several sets himself—more to save time than money. Finally, however, he thought he'd better find out what was behind the trouble. Every so often the engine would stumble and run roughly on acceleration; and new points seemed to help the situation.

The owner took the cab into the shop and told Bill about the trouble he had been having. Bill, being trained in the value of testing, checked the charging voltage and found it too high. He figured that this was the reason for the burned points. So he adjusted the regulator to get the voltage down where it should be; put in new points, and set the dwell and ignition timing correctly.

A couple of weeks later the cab was back in the shop with the old complaint of stumbling and roughness on acceleration, though the engine had operated quite satisfactorily until a few days ago.

Bill once more checked the charging voltage and timing. This time they were within specifications. Inspection of the points showed them to be in good shape. How about the spark plugs, the high tension wiring and engine compression?

The plugs were removed, even though they had only gone a few thousand miles, but they looked good, were of the right heat range, and reasonably clean, with no cracked insulators. The spark gaps were within .002" of specifications. The high tension wiring was in good condition, with no dried out or cracked insulation. The tower contacts of the distributor cap and the coil were clean and firm, with no corrosion.

Checking the compression showed it right up where it should be, and all the cylinders within 5 to 8 lbs. of each other. The fuel supply was checked and found to be equivalent to a pint in 40 seconds; which was adequate for the six cylinder engine. The carburetor seemed in satisfactory condition, since the engine idled smoothly, there was no dying out, and gas mileage was reasonable. Starting was easy, and the carburetor accelerating pump worked properly.

Bill went on "I kept asking myself what was left that we hadn't checked? Finally it came down to about the only thing that was left—the intake manifold. I couldn't quite figure how the manifold would cause stumbling on acceleration, but it had to be the manifold.

"So off it came—and you won't believe this! The thing was so filled with carbon that I couldn't get my little finger through the passages. Now I could see the reason for the stumbling: when the driver opened the throttle to accelerate, there just wasn't enough air-fuel mixture getting through the choked passages.

"We probably could have dug out the carbon, but it was cheaper to put on a new manifold, which we did. And that licked the stumble. The guy that owns the cab sure was happy to have his rig running right again."

Even for the Instrument Man, this was a new one. He brought up the question of how and why the carbon formed in the manifold. Neither of the boys could offer any theories.

HOW AND WHY

Jim then said to them: "Maybe this will help to explain how such a condition could come about. You know that there is valve overlap on all engines, where the intake valve opens before the exhaust valve closes as the piston approaches top dead center.

"Engine designers tell us this is necessary for better purging of the exhaust gases on the exhaust stroke, and better flow of fuel-air mixture on the intake stroke. On the older engines it ran from about 15° to possibly 30°. But on the new V-8's with higher compression ratio, the range is from about 25° to as much as 45°. This means that during the period of the valve overlap, there is a direct connection between the intake manifold and the exhaust manifold. The intake is then under a vacuum of from 5 to 21", so that there is a flow of exhaust gases into the cylinders through the intake manifold.

"With all the idling that cab engines do, there is low velocity through the intake manifold when idling. This provides ample opportunity for the build up of carbon on the walls of the manifold when the carbon-bearing exhaust gases mix with the slow-moving, relatively cool incoming gases. Some studies that have been made indicate that, at idle, as much as 60 per cent of the cylinder content is exhaust gas that re-enters the cylinders through the intake manifold.

"At higher speeds the proportion

(*Continued on page 78*)

WHY INSTRUMENT CORNER?

Because we know the help he's given so many shops first-hand is just as valuable in the re-telling as it was in the happening, we've asked The Instrument Man to pass along some of his more interesting experiences. As an old-timer in automotive servicing who is distinguished by the fact that he's kept up-to-the-minute on developments in his field, The Instrument Man gets many calls for help from friends, acquaintances and even strangers, in shops large and small. He generally solves the cases, because of his understanding and appreciation of trouble-shooting instruments.

In the automotive service business...

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CHEVROLET DIVISION OF GENERAL MOTORS, DETROIT 2, MICHIGAN

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Ben Ikert, Editor

Grounding the Coil

Which is the best way for a coil to be installed on a car? Should the case of the coil be grounded to the engine or not? I say it should, as the two windings inside the coil are grounded to the case. My buddy says that it makes no difference.—*H.B.G., Novato, Calif.*

Answer: The coil does not have to be grounded because the primary winding is in series with the hot side of the battery and flows to ground through the breaker points, while the secondary is connected to the hot side of the battery the same as the primary, and the HT current flows to ground through the spark plugs.

If you will look at a wiring diagram of an ignition system you will see that neither coil winding is grounded to the case. If they were, the coil would not work.

Low Speed Hesitation

A 1955 V-8 DeSoto (with automatic transmission) hesitates or cuts out in Drive between 8 to 12 m.p.h. Up to or after that speed, the engine runs smoothly.

I have rechecked my tune-up job, but all I can find is low compression in all cylinders. I hesitate to recommend a complete overhaul to correct this trouble, and would like your opinion. *J.M., Amsterdam, N.Y.*

Answer: We would be inclined to suspect the carburetor. If possible, use a combustion analyzer to see how it acts as to air/fuel mixture and check the action of the accelerating pump. It would also pay you to make an oscilloscope test to see if anything shows up during the transition from 6 to 15 m.p.h. If there is a dynamometer in your town, and you can run the car on it, you will have the opportunity of making some interesting and informative tests. It isn't a case of "I'm sick, what's the matter with me?" Tests will have to be made to determine the cause of the unsatisfactory condition.

If the engine runs well at speeds other than the ones mentioned, an overhaul is not necessary. Be sure the dwell, engine ignition timing, spark plug gaps, fuel pump pressure, etc., are in accordance with factory specifications. After the engine is eliminated, check the transmission.

Figuring Horsepower

Will you please tell me how horsepower of the modern engines is worked out. Can you give me the formula, using a 1953 Ford V-8 as an example? *K.W.B., St. Thomas, V.I.*

Answer: The basic formula on which engine horsepower is figured is:

$$H.P. = PLAN/33{,}000.$$

In this formula, P=mean effective pressure (determined from an engine indicator diagram; L=length of piston stroke in feet (in. X 12); A=area of one piston in square inches; N=number of power strokes of the engine per minute (4 x r.p.m. on an 8 cylinder engine). The mean effective pressure for the 1953 Ford V-8 about which you ask is 96 lb. Bore 3.1875"; stroke 3.75".

Therefore:

$$H.P. = \frac{96 \times 3.75 \times 8 \times 15200}{12 \times 33{,}000} = 110 \text{ H.P.}$$

96 is the M.E.P., 3.75 is the stroke in inches, 8 is the area of the piston in square inches, 15200 is 4x3800 r.p.m., 33,000 is number of ft. lb. per minute in one H.P.

The horsepower formula used for license purposes goes back to the old A.L.A.M. days (American Licensed Automobile Manufacturers) when, for the engines in use in those days it was approximate, though far off for present engines. It is:

$$H.P. = D^2 \times N \times 4$$

where D is piston diameter and N is number of cylinders. Using this formula, the 1953 Ford in question would have:

$H.P. = 3.1875 \times 3.1875 \times 8 \times .4 = 33$ H.P.

WHEN CHANGING YOUR ADDRESS

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"Blue Points" on Imperial

Am having ignition difficulty on a 1957 Imperial; this car burns ignition points blue in about two weeks. Since this indicates a high voltage condition, I have done the following in an attempt to correct the trouble:

Installed new ignition resistor, checked circuit for resistance, replaced points and condenser, completely checked generator and wiring, checked coil and set voltage regulator to lowest possible limit. However, on setting regulator, I noticed that when car was revved up, the current regulator points remained open, but only for a few seconds. After that, the regulator was able to be set nicely.

Inasmuch as there was nothing wrong with the generator or wiring, and the current regulator points acted properly, I replaced the voltage regulator, setting it to it's lowest possible limit . . . but the points still burn "blue". *D.A.S., Exeter, Pittston, Pa.*

Answer: The first thing to do is to check the ignition voltage at the battery side of the coil, which should not be over 10 volts. On Chrysler cars, a resistor is used which has a temperature coefficient such that within a very short time after the ignition current starts to flow, the resistance builds up enough to reduce the ignition voltage to about 10 volts. If the resistor is the wrong one, or is not working right and does not cut down the voltage, burned points will result.

You might try using a resistor from a Buick to replace the one on the car, running a wire from the *motor* side of the starting motor control to the coil side of the resistor so it will be cut out while the cranking motor is operating.

(*Continued on page* 12)

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- no holes to drill for adhesion
- safe to use
- best discounts

KwikMetal

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SAVE MONEY: One pound of KwikMetal does the work of six pounds of lead. KwikMetal *stays* where you put it.

MAKE MONEY: KwikMetal discounts are planned for greater profits. You earn more with KwikMetal!

Metal fill? KwikMetal is best!

Metal fill? KwikMetal is best!

APPLIES LIKE PUTTY—HARDENS LIKE STEEL

THESE SPECIAL ADVANTAGES:

- Fast 3-step repairing
- Costs no more than the "ordinary"
- Easy, error-free mixing
- Smooths on—no drag
- Reinforced with Fiberglass
- No solvents—NON-Inflammable
- Safe to use
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- Sets in 5 minutes WITHOUT USING HEAT LAMPS
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- Made by Mfgr. of KwikMetal, your guarantee of quality.

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the wonder PLASTIC

SETS FASTER . . . READY TO SAND IN 5 MINUTES!

SpeedBond mixes quickly and easily . . . smooths on without drag. It's unaffected by water, gasoline, oil or solvents. SpeedBond has no waste, doesn't shrink . . . no "build-up" necessary, it fills deep repairs in one application.

SPEEDBOND normally sets in ½ hour; speed it up to FAST 5 MINUTE SET with SpeedBond "Liquid Heat" RAPID-SET. NO lamps or special equipment needed!

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Plastic Fill? SpeedBond is best!

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ATOMIZED MATERIALS COMPANY, INC.

207-G RAUCH BUILDING **PITTSBURGH 5, PA.**

Nothing can steal your profits like "comebacks" . . . and nothing will drive your customers away more surely than repair jobs that don't stay repaired.

Why do jobs come back?

A recent survey has found that more than 50% of generator and starter comebacks result from wrong or incomplete diagnosis of the cause of failure of the replaced part or unit. In other words, the part which fails is replaced or repaired, but the job comes back because the real *cause* of failure was not found.

Approximately 30% of comebacks are the result of incomplete or incorrect repair of related parts such as regulators and wiring, and just over 10% are caused by incorrect installation of replacement units themselves.

This is an unnecessarily high figure, because most of these comebacks can be prevented by proper testing before jobs leave the shop. Furthermore, the cost of adequate testing is much less than the expense of a second, more complete repair job which, in many cases, cannot be charged for without the risk of losing a customer. "Comebacks" cost *you* the mechanic's time, plus the cost of more parts to replace those which have been "spoiled."

Less than 1% of comebacks result from imperfect replacement units, and there seems to be no substantial difference in this percentage between new units and units rebuilt by reliable companies.

Preventing "comebacks"

Despite the many possible causes of comebacks, preventing them can be reduced to a four point formula:

1. Be sure the real cause of failure of the original unit is found and corrected, then
2. Install a reliable replacement for the defective unit;
3. Be certain the replacement unit is properly installed;
4. Finally, test the finished job before it leaves your shop.

First, let's talk about finding causes of failure. The other three points in the prevention of comebacks will be discussed in later issues.

What causes failures?

Often the causes are simple enough, but hard to find. In the electrical system for example, 75% of all failures can be traced to faulty wiring or loose connections in the charging circuit. And the next most common cause of failure is a regulator which is faulty or out of adjustment.

But despite these two simple facts, which every good mechanic knows, generators are often replaced without determining why they burned out. Naturally, the replacement generator will burn out too unless the cause of the original burn-out is found and corrected.

This kind of error is seldom made by experienced mechanics, but constant training and retraining of younger men is necessary before this most common cause of comebacks is prevented.

Information on causes of failures is available from many sources. To help you locate trouble in the charging circuit, a 10-page shop guide, "Don't Blame the Generator," is available Free to Repair Shops east of the Mississippi River.

For your free copy write to Technical Service Department

ARROW ARMATURES COMPANY
10 Fordham Road, Boston 34, Mass.

Automotive Clinic . . .

(Continued from page 10)

Another cause of burning points is the presence of oil or grease in the distributor from too much being put on the breaker cam. The points must be meticulously clean. The next set you put in should be cleaned with crocus cloth, then carbon tetrachloride and then wiped with lintless cloth.

Valve Breakage

In our shop we are having a problem with two 1952 Powerglide-equipped Chevrolets. Both of them break off the head of one valve which in turn breaks the piston or block.

The last time this happened, we installed a factory-rebuilt block and broke it in carefully. After 1500 miles the head of the exhaust valve for number one piston came off at about 55 m.p.h. and broke a hole in the top of the piston. This same thing happened to another '52 Chevrolet with Powerglide three times.

Before this happens again, would appreciate your giving us any help you can. *E.R.K., Ruthton, Minn.*

Answer: The cause of valve breakage is not too well understood, but one fact that is recognized is valve seat run-out. If a valve seat has a run-out or is not true with the true center line of the valve stem guide as much as .004″ to .005″, as many of them are, you can see that there is a bending force applied to the valve stem every time the valve closes. Therefore, one step we would recommend is to regrind the valves and measure every seat with a dial indicator to make certain it is concentric with the center line of the valve stem guide within .001″. Then set the tappet clearance to specifications on adjustable rocker arms, or if the lifters are of the hydraulic type, see that they are working properly.

The fact that the same valve breaks each time would seem to indicate that the valve seat is not true. Other than this, about all you can do is put in the best valve you can obtain.

Lights Flare Up, Then Dim

Am having trouble with the lights on a 1952 6-cylinder Plymouth. When car is driven with generator charging, lights will brighten; when stopping, lights practically go out.

I have checked all cables, including dash wires (ammeter, clock, direction signals, etc.) installed new voltage regulator, as well as a new generator and battery. Even put in new Sealed Beam units. *J.W., Columbus, Texas.*

Answer: To get uniform light intensity on an automobile, there are three

factors that have to be considered: 1. Voltage regulator; 2. Battery; 3. Wiring in the charging and light circuits.

First check the battery by loading it up to three times its AH rating for 15 seconds and checking the voltage drop (which should not be more than 1 to 5 volts on the voltmeter). If it goes lower than this, either the battery is defective or it needs charging.

Carefully check the voltage regulator setting, which should be approximately 7.4 volts in a 6-volt system. If this is not right, set it correctly. Next check the voltage drop from the battery to the headlights. You can puncture the insulation next to the lamps to get the reading. This should not be more than .2 volts. It is probable that the dim lights are caused by high resistance in the circuit or in the light switch. If the controlled voltage from the generator is too high, it will make the lights brighter than normal, which will make them look dimmer by comparison, when operated on the battery.

Won't Start When Hot

Am having trouble with a starting motor on a customer's '52 Chevrolet with Powerglide. The starter will not turn the engine over when hot. When cold it turns over very freely and fast, starting quickly even in sub-zero temperature. After the car stands for about half an hour, it starts without any trouble.

This starter was previously overhauled, with no improved results. Armature, field coils and brush holder test out O.K. New cables and battery were installed. Current draw is normal when motor is cool; when hot it draws over 500 amps. Armature is not dragging. *B.S., Killdeer, N.D.*

Answer: This complaint has come up a number of times, but more commonly with the newer high compression engines. Judging from your description of the trouble, the hard starting when hot is due to the Diesel effect of the compression, probably caused by excessive carbon build up in the cylinders, which generates enough counter pressure in the cylinders to prevent the engine from being turned over by the cranking motor. When the engine is cold and starts with a mixture enriched by the choke, you do not have this condition.

One way to start the engine is to pump the accelerator pedal three or four times before trying to start when hot. This will enrich the fuel/air mixture enough to make it somewhat less explosive, so the Diesel effect will not be present.

It is quite possible that if you take a compression reading you will find it higher than normal for this engine, because of carbon or lead deposits in the cylinders.

Timing a '58 T-Bird

Been working on a customer's 1958 Thunderbird with automatic transmission. The "book" says to set the timing 6 deg. *before* with automatic transmission. We did this and all the car does is ping and "smoke".

Then set it 18 deg. *before*, which eliminated "smoke" and ping . . . but it will ping when you step hard on the gas when going down the road. Have tried to reset the timing all over, but to no avail. *J.H., Tonica, Ill.*

Answer: You read the "book" right when you found the ignition timing to be 6 deg. before top dead center. When setting the timing, however, the line to the vacuum advance should be disconnected so there is no vacuum advance whatsoever at this time. After setting the timing, reconnect the vacuum line. This will give you the correct timing for an engine with automatic transmission.

The big engine on the 1958 T-Bird has a 10.2:1 compression ratio, so you cannot expect it to run without pinging on regular gas. It is built to use Ethyl gas, and unless this is used, the engine will not be free from ping.

Low-Speed Performance

A customer is having performance trouble with his 1956 Chevrolet (Model 150, standard transmission). The complaint—no pep or pick up at speeds under 40 m.p.h.

Checked it over and found compression okeh. Installed new plugs, points, coil, condensor and tested distributor, which was okeh. Timing was advanced to a point where slight ping appears at open throttle on a hard pull.

Valve mechanism was cleaned and readjusted, after which car seemed to run much better than when first brought to shop, but it is still not right as far as pick up is concerned. *C.P.C., Stony Point, N.Y.*

Answer: To check performance, we would recommend putting the distributor on a distributor tester to check for firing pattern and for vacuum and automatic advance. From your letter we suspect that the vacuum advance is not acting as it should.

Another thing to check is the accelerating system in the carburetor. If this is not working right, it could cause poor acceleration. Also check the power enrichment on the carburetor to see if this is working right. A test with a combustion analyzer will give you some helpful information.

Solved with these Original Equipment Units Completely rebuilt by Arrow

GENERATORS by Arrow

Factory rebuilt, then work tested to eliminate comebacks . . . once correctly installed, trouble-free performance guaranteed.

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Rugged and reliable. Factory rebuilt . . . work-tested. Quality and performance guaranteed.

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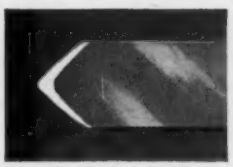
● Want faster seating ring jobs? Want oil control in tapered, out-of-round or re-bored cylinders? Then you need Hastings Chrome-Vent oil rings. They seat 3 to 4 times faster than any other chrome rings made. They assure positive oil control right now. They eliminate profit-cutting come-backs.

The Hastings patented *beveled chrome* rail makes *immediate fineline contact* with the cylinder wall. It has less contact area to wear-in—takes less time to break-in.

Chrome-Vent gives at least 3 times greater chrome wearing surface, too—because the thick chrome cap extends *around* the bevel. And, with the lighter inner-spring made possible by the beveled design, it makes gentle, soft-pressure contact with any cylinder wall.

Always use Hastings, the product of replacement specialists. You'll be sure of a good profitable ring job and a satisfied customer, too.



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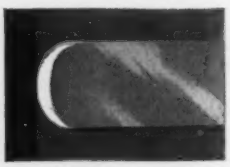
Rails make fineline contact with cylinder wall for a faster seat. Less area to wear-in means less time to break-in.



CONVENTIONAL CHROME RAIL
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BEVELED CHROME-VENT PISTON RINGS

TOUGH
on oil-pumping

GENTLE
on cylinder walls

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Piston Rings, Oil Filters, Casite Additives, Spark Plugs
Hastings Rings are covered by
U. S. Patent Nos. 2148997, 2511874, 2565042, 2712971

Editor's page

What's a "good" job?

• AMONG ITS OTHER advantages, the flat rate pricing of repair operations organizes and arranges these operations into logical, quickly-identified groups. Such groups avoid confusion, pin point exact procedures and of course, save time.

Since the introduction of flat rate, many years ago, the matter of time-saving on the job without sacrifice of quality in workmanship, has become more than ever the "secret" of a sound service business. Mehanics devise their own short cuts . . . equipment makers design special tools and machinery . . . schools and manufacturers' training courses teach latest procedures. All this to save labor-time per job, and allow more jobs per day in the shop.

Closely allied with flat rate in the attainment of profitable and efficient service, is the vital item of unit and parts cleaning. It is a great time-saver—often the very thing that makes it possible for the mechanic to "meet" (or actually beat) the flat rate.

Again, thorough and efficient parts cleaning promotes precision, so vitally necessary in safeguarding service work and avoiding comebacks. A small speck of dirt, for example, can ruin a bearing, or at least shorten bearing life—possibly enough to bring the job back for re-work. Thus, flat rate in itself is no guarantee of quality workmanship—cleanliness and precision still must team up with it.

Successful use of flat rate is linked inseparably with craftsmanship. Once the customer has authorized the cost of a repair job based on the shop's analysis and recommendations, then management and mechanics are on the spot. The presence or absence of craftsmanship will determine if diagnosis was on the beam, if the shop will get its "labor's worth" along with a fair profit.

From estimate through customer pick-up of the serviced vehicle, each step in shop work must be based on genuine trade knowledge. To that must be added the full and fair use of the knowledge to the benefit of both shop and car owner. These add up—as they always have—to jobs that are priced right, done right and sold right.

Although all pro's" know it so well, it's worth remembering rather often that the only satisfactory service operations are the ones into which the shop has "built" all the elements it takes to do the best possible work.

Ben Ikert
EDITOR

Precision starts in the cleaning tank

Starting off a job with clean parts promotes good work, better working conditions, good shop morale and safety. Clean parts are easier to inspect and check; the time saved, alone, being a strong plea for adequate cleaning.

● FIRST BIG ADVANTAGE of working with clean parts during any service or repair operation is that of promoting precision.

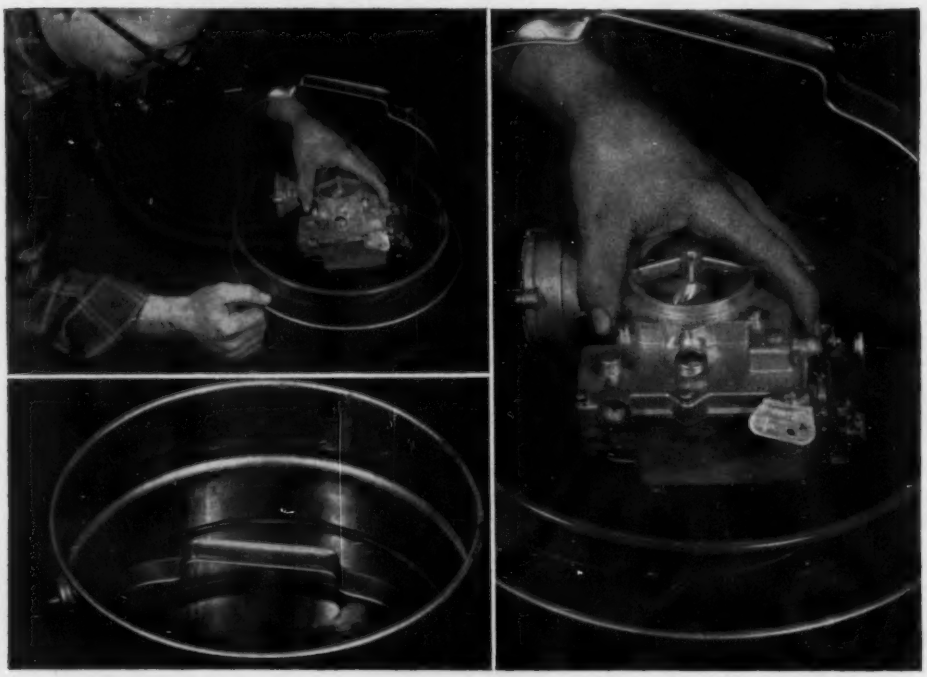
A mechanic working with clean parts starts off right. Measurements will be more accurate. Tolerances will be more exact, and the completed job will have precision quality so important for customer satisfaction and shop profit.

Occasionally the fact is overlooked that original equipment parts and replacement parts are manufactured on the same rigid schedule of tolerances. No allowances have been made in this schedule for even small amounts of carbon, scale, and similar deposits or accumulation of foreign matter. In some instances the foreign material is the primary cause of the service complaint. Good examples of trouble caused primarily by deposit or accumulation of foreign matter are sticky valves and a dirty carburetor.

Second, is the advantage of better working conditions and good morale in the shop. A mechanic working with clean parts in a neat shop is bound to have more pride in his job. Actually, a mechanic's time is too valuable to waste it by having him work with dirty parts. Clean parts are easier to handle. Tools stay cleaner and last longer when they are used on clean parts. Thus it's easy to see that a parts cleaning program speeds up a job; makes the job better for the mechanic, and thus assists the mechanic in doing a better job.

Third is the advantage of improved shop safety. In this case, the improvement in shop safety may be the safer handling on a heavy part, or it may be a longer range effect on overall shop safety.

There is little question that a clean engine or transmission is safer to handle than an engine or transmission covered with the usual accumulation of grease, road oil, and grime. Working with clean parts keeps the shop cleaner, too. Safety engineers say that one of the most



Upper left: Dirty carburetor is placed in basket of bucket-type parts cleaner and lowered into cleaning solution (lower left). In a few minutes carburetor is removed (right) clean as a hound's tooth.

important elements of safety in the shop is good housekeeping. If working with clean parts keeps a shop cleaner it is a good bet that housekeeping around the shop is easier and more effective, too.

Another important advantage of a good parts cleaning program is the effect it has on customer satisfaction and good will. A clean finished job has a professional touch that quietly calls attention to the skilled craftsmanship that went into its completion. It is pretty much the old story of a good job being able to speak better for itself. This is not to say that making a job look clean is all there is to doing a good service job. However, doing a service job with clean parts is easier; the completed job will be better, and it will look better. The advantages or benefits cannot be measured in dollars and cents.

PARTS IN THE CLEANING PROGRAM

Parts cleaning includes practically all of a car's subassemblies or parts. Typical of these parts are:

Brake drums	Connecting rods	Oil pumps
Camshafts	Crankshafts	Pistons
Engine blocks	Differential parts	Steering gear parts
Filter screens	Distributors	Transmission parts
Carburetors	Fuel pumps	Valves
Clutch parts	Oil pans	Water pumps, etc.

WHAT IS THE PARTS CLEANING JOB?

Parts cleaning is more than just removing loose dirt and grease. Instead, parts cleaning means cleaning right down to the bare metal to remove all foreign substances from every surface. The following are typical of the substances to be removed:

Caked-on dirt	Gummy deposits
Carbon	Grease
Engine varnish	Oil and sludge

The major portion of interior engine soil encountered in the cleaning job is carbon and deposits caused by burned lubricating oil, and the residue of leaded fuel combustion. Other soils found inside the engine include crankcase sludge, engine varnish, and blow-by solids.

Actually, most of the foreign deposits are little more than the every day brand of dirt and grime that collects on an engine. However, when they are burned, baked, dried, or worked into a metal part they can be mighty tough to remove. As tough as they may be to remove (without using special equipment and special cleaners) the service job is tougher if the substances are left on the parts.

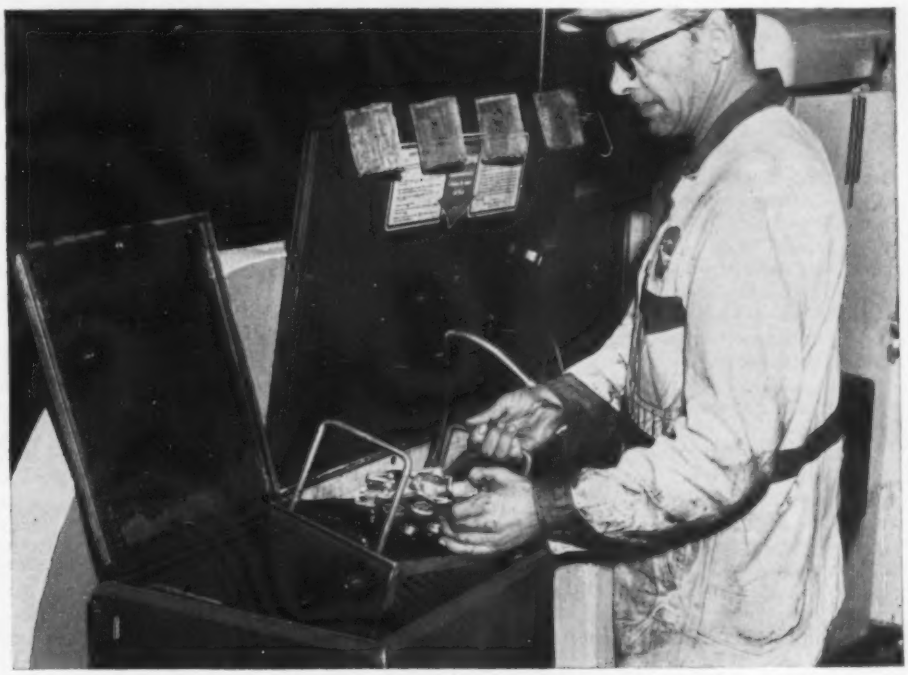
Most of the parts to be cleaned are irregular in shape and have numerous precision ground surfaces. Scraping or brushing would be difficult and generally a waste of valuable time. The finished job usually is far from satisfactory. Carefully machined surfaces may be damaged and many surfaces may not be thoroughly clean. For many parts there just isn't any way to do the cleaning job other than to use the proper cleaner with the right cleaning equipment. In many cases it's like trying to hone a cylinder by using a tool designed to turn down a brake drum. When the right cleaner is used with the right cleaning equipment, the parts cleaning job can be as simple, as efficient, and as profitable an operation as any other service performed by the shop.

HOW DO CLEANERS CLEAN?

A good idea of how cleaners clean can be gained from comparing parts cleaning with the way soap and water remove dirt from a person's hands. The key point to keep in mind is that dirt or grime by itself does not stick to the hands. Generally, the tiny particles of dust that make up what appears to be a layer of dirt are coated with a film of oil or some similar adhesive type substances. Even without a coating of an adhesive substance, the dust particles cling to the natural oil on the surface and in the pores of the hand. As a result, the layer of dirt adheres to the skin.

If the hands are washed in water alone some of the dirt may be washed away. However, most of it will still remain; the water worked under some of the particles that did not adhere so tightly to the skin or to surrounding dust particles. When soap is applied the dirt is loosened

By FRANK E. LEE

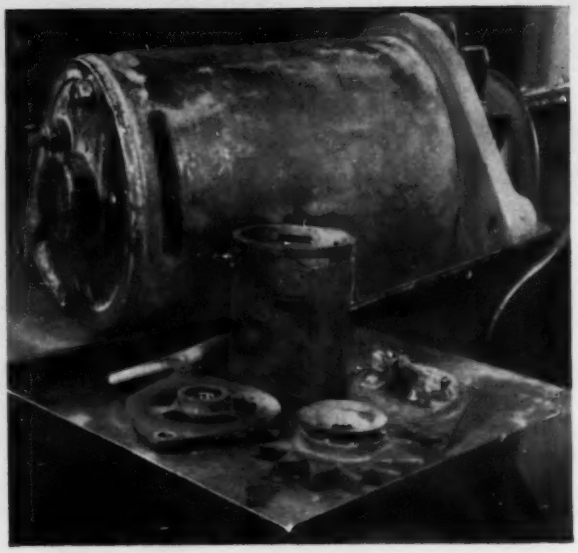


Many parts cleaners are equipped with a special compartment for cleaning carburetor parts.

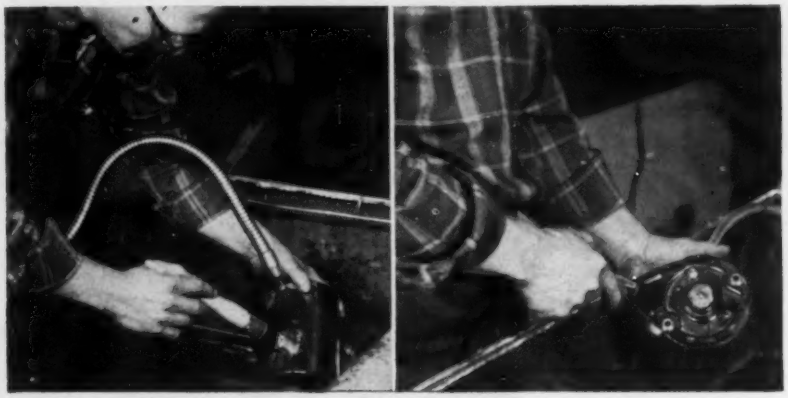
and seems to float away. Actually, the soapy solution *cut through and undermined the substances causing the dirt to cling to the skin.*

Dirty parts are caused by conditions similar to those that cause dirt to cling to the hands. With dirty parts, however, the substances binding the dirt and foreign matter to the metal are tougher and generally the entire combination is baked into a hard, glazed layer. Although the layer of dirt on the metal parts is tougher, its removal is the same. All that is needed is a cleaning solution that will cut through, loosen, and undermine the binder substance and literally float the dirt away.

Actually the terms "cut through," "loosen," and "undermine" are not included in the language used to describe parts cleaning solutions in general. Among the more common terms associated with chemical cleaners are *wetting action, emulsifying action, solvent action,* and *colloidal activity.* An understanding of these terms will help a person realize that chemical cleaning is one of the most effective ways of removing the last traces of dirt from automotive parts.



Typical of many parts to be serviced is this generator. Unless thoroughly cleaned both inside and out, it is hard to expect a mechanic to rebuild it with speed and precision.



A parts cleaner makes short work of removing grease and grime from generators or any other units. A quick blast of air (right) does the drying.

WETTING ACTION

Wetting action causes the cleaning solution to come in direct contact with the substance to be removed. This is an important requirement because the cleaner must contact the foreign material. Otherwise the cleaner cannot do a thorough cleaning job. Actually, wetting action is not a natural characteristic of all liquids. To a large extent, the degree of wetting action depends upon the surface to which it is applied, as well as to the liquid itself.

For example, water tends to gather in pools or drops when applied to an oily surface. This situation occurs because the surface tension of the oil and water resist or oppose each other. Ordinary water has a higher surface tension than most oils.

Water can be treated chemically to reduce its surface tension to the same level as an oil film or a group of oil films in general. The water will spread over the film of oil when the surface tension of the two liquids have been equalized.

The surface tension of water can be reduced until it is less than the surface tension of the oil film. The water will penetrate the oil film. The displaced oil will gather in droplets and pools on the surface of the water film—a complete reversal of the reaction when the two liquids contact each other in their natural state. The chemically treated water may not completely detach the oil from the surface being cleaned. However, the surface of the oil has been penetrated, and this in itself is a big step in the cleaning process. The important point to keep in mind is that water can do a better cleaning job if it is treated chemically to make it wetter than it is in its natural state.

EMULSIFYING ACTION

To emulsify means to cause minute particles of a liquid to remain in suspension like the fat globules remain in suspension in a glass of milk.

The adhesive forces binding a film of oil to a metal surface are exceptionally strong. The grip of the oil on the surface is loosened by increasing the wetting action of the water. The next step is the addition of an emulsifying agent to detach the oil particles from the surface and, literally, cause the oil to combine with the cleaning solution. Basically the cleaner has digested the oil. Once assimilated or combined with the cleaner, the oil cannot be redeposited on the surface.

Emulsifying agents are used in most hot tank cleaners to disperse detached oil in water. In most instances the emulsifying agent permits oil particles to join together when they come in contact with each other. The droplets form a continuous oily layer on the surface as more oil enters the cleaning solution. This is a desirable feature, because the oil can be skimmed off the surface to prolong the useful life of the cleaning solution.

COLLOIDAL ACTIVITY

Colloidal activity is the breaking up of a solid mass and the dispersal of the particles evenly through a fluid. Colloidal activity is an important characteristic of cleaners used to remove carbon and similar deposits. Carbon is made up of insoluble solid particles held together by a hardened binder of gum and resin. Colloidal elements in the cleaner disperse the solid particles as they are loosened. This causes the loosened solid particles to be lifted away from the parts being cleaned. Colloidal forces are also effective in softening and swelling resinous binders used in paints, enamels, varnish, and similar coatings.

SOLVENT ACTION

A good demonstration of solvent action is the way ordinary table salt dissolves in a glass of water. The salt is broken down into particles so small they cannot be seen, even under the most powerful microscopes. Water is effective as a solvent with certain salts, acids, and alkalis. Other solvents derived from petroleum, coal, or wood can dissolve oil, grease, wax, resin, paraffin, and related substances.

Organic solvents—solvents formulated of compounds of artificial origin—can be made into cleaners which are chemically neutral. These cleaners are safe to use on the more reactive group of metals like aluminum, copper, magnesium and zinc. Extremely difficult cleaning jobs, like removing carbon, gum and varnish from engine parts can be handled easily by organic solvents.

The cleaners dissolve the oil and resinous binders that hold particles of carbon together. The carbon deposit can be flushed off after the adhesion of the carbon particles is disrupted. In most instances a carbon deposit is the result of a gradual buildup of successive layers of carbon. An effective cleaner will penetrate through the entire deposit. Thus the adhesive substances in the complete deposit can be broken in a single cleaning operation.

GASOLINE AND SIMILAR VOLATILE SOLVENTS

Gasoline and similar refined solvents are a poor substitute for the safer chemical cleaners available for the parts cleaning job. Volatile solvents like gasoline or naphtha are a fire hazard at all times. The cost of these solvents is too high to use them for purposes for which they are not intended. Finally, gasoline and similar volatile solvents are not designed to remove all of the foreign deposits that collect on automotive parts. As a result a person using gasoline and similar liquids as a substitute for chemical cleaners is paying a high price for a poor and extremely hazardous cleaning job.

Smaller automotive parts are generally immersed in some sort of container or tank during the cleaning process. The cleaning solution may be either hot or cold, depending upon the formulation of the cleaning solution and how it is to be used. Thus the various cleaner methods have been divided into the broad classification of hot tank cleaning and cold tank cleaning.

Some dirt and other foreign material on engine parts can be removed quite easily without immersing the parts in a tank using a hot or cold cleaning solution. If this easily removed grime, oil, and dirt is removed before the parts are placed in the cleaning tank, the life of the cleaning solution will be extended. Typical preliminary cleaning methods are as follows:

1. **Emulsion type cleaner**
   An emulsion type cleaner is sprayed on the subassembly or part. The cleaner and a large percentage of the grease and dirt are removed by flushing the part with water after a few minutes.

2. **Steam cleaners or vapor cleaning equipment**
   Water in combination with a cleaning solution is pumped into heating coils in this type equipment. The solution is discharged through a cleaning gun or nozzle to form an effective penetrating spray. Considerable time is saved in the preliminary cleaning operation by this combination of cleaning solution, moisture, heat and pressure.

Spic and span after cleaning and drying, this generator is an open invitation to fast, precision service.

3. **Vapor de-greasing equipment**
   Volatile solvents in a storage chamber are heated in equipment of this type. The vaporized solvents rise to an upper chamber in which the parts to be cleaned are suspended. The vapors condense as they strike the cold parts. An efficient degreasing action results because the vapors envelop every surface of the parts being cleaned. Vapors which rise above the parts to be cleaned are trapped and condensed in special cooling fins placed at the top of the equipment. This prevents unnecessary waste and adds to the safety of the equipment.

COLD TANK CLEANING

The cold tank method of parts cleaning uses specially formulated volatile type solvents at normal room temperatures in a tank that will hold the parts to be cleaned. Generally the volatility of these cleaners is controlled by a liquid seal that floats on the top of the cleaner. The seal is broken only when the parts to be cleaned are placed into or removed from the tank. The seal provides

a wiping action on the various surfaces as the parts are removed from the cleaning solution. This reduces the drag out losses from the cleaning tank. The seal can also be made to prepare the surface of the parts for easy rinsing.

Parts are soaked in tank type cleaners until the foreign deposits are softened and loosened by the wetting action of the cleaner. Then the parts are removed from the cleaning solution and placed in the rinsing or flushing compartment of the cleaning tank. The loosened dirt is removed by spraying with air and water, air and a safety solvent, or a high pressure stream of water. The useful life of the cleaner can be extended if the parts are carefully handled to prevent excess dirt getting into the cleaning solution.

The cleaning agents used in cold tank cleaning can be formulated so they are not corrosive when used on aluminum, brass, bronze, iron, and similar metals used in automotive parts.

Some cold tank cleaners use high flash point cleaning compounds. These cleaners, while still classified as volatile type cleaners, are less volatile than gasoline, kerosene, and similar petroleum products. Because of the higher flash point the cleaning solution can be pumped in a continuous flow through a flexible hose mounted in the tank. The hose can be placed in any position to direct the cleaning solution over the part or parts to be cleaned. Generally these cleaners have a filter system that prolongs the life of the cleaning solution. In many instances the cleaner is equipped with an air agitated soaking compartment.

In most instances the washing or soaking compartment of a cold tank cleaner should be large enough to accommodate an engine block or a basket of parts. An air agitating pipe connected into this compartment can be used to circulate the cleaner around and through the parts to be cleaned.

The rinsing operation is simplified if the tank has a rinse compartment about the same size as the soaking compartment. Parts can be rinsed in this without splashing water over the walls and floor of the shop. Some tanks have anti-splash baffles on the sides of the rinsing compartment to avoid excessive splashing.

A removable sludge pan equipped with a hoisting chain can be used in the rinsing compartment to facilitate cleaning the tank. Both compartments of the tank should be equipped with a sump drain-off or clean-out plugs.

Some cold tank cleaners have a third compartment used as a decarbonizing section. Usually this compartment is smaller than the soaking and rinsing sections of the tank. This section is used to remove carbon and engine varnish from carburetors, connecting rods, fuel pumps, pistons, rocker arm assemblies, valves, and similar engine parts.

At least one of the manufacturers is marketing a parts cleaner in a four or six gallon bench size pail. The pail is equipped with a dipping basket and contains a cold type cleaner to remove carbon, lacquer, gum, and grease. A cleaning outfit of this size can be used to clean any of a number of smaller parts such as carburetors, fuel pumps, bearings, and similar parts. The cleaner has a covering vapor seal to prevent evaporation and to eliminate the odor problem.

Some manufacturers recommend that parts be immersed in a steel tank and soaked until carbon and sludge have been loosened. Usually this requires between 10 to 40 minutes. The loosened dirt can then be flushed off during the rinsing process. Flushing off the dirt, instead of soaking the parts until the dirt is detached, reduces the amount of sludge that will settle to the bottom of the cleaning tank.

Cleaning an automatic transmission. The cleaning machine has a circulating pump and nozzle adjustable to any position.

HOT TANK CLEANING

The hot tank method of parts cleaning uses a cleaning solution maintained at an elevated temperature in a specially constructed tank. A definite shearing action is created by the movement of the solution as it is heated in these cleaners.

A hot tank generally has a grill to hold the parts above the sediment and sludge that gathers at the bottom of the tank. Automatic controls keep the solution at the correct temperature for uniform cleaning results. Automatic controls also facilitate overnight cleaning which may be required to remove some deposits of foreign material. In most instances hot tank cleaners are equipped with covers to help maintain the temperature of the solution and to control any fumes that may be created.

AGITATION OF CLEANING SOLUTION

Some manufacturers recommend agitation of the solution to speed the cleaning process. In most instances the parts cleaning job is accelerated as the agitation of the parts and/or the cleaning solution is increased. There are several ways in which the cleaning solution can be agitated, as follows:

(*Continued on page* 82)

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GENUINE ORIGINAL EQUIPMENT PARTS FOR THE MOST POPULAR CARTER CARBURETORS
At a Sensationally Low Price!

Now make more profit two ways! *Sell* the need for a quick carburetor clean-out with every tune-up . . . then *insure* your skills and labor with *genuine original equipment parts* . . . in the new *low-priced* Carter Zip-Kit! Made by the same manufacturer whose carburetors are on 24 million cars today . . . now available to you at a tremendous per-kit saving! Call your supplier today.

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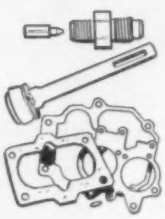

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In today's highly competitive automotive service market,

it's more important than ever to make sure you're . . .

Pricing the job—right

By HERB CARRIER
Detroit Editor

• ONE OF THE MOST baffling experiences in the entire automotive repair field is to hear a discouraged shop owner say, "I'm stumped. I run a busy shop; have plenty of customers, but it's a real tough grind trying to scrape up enough money to meet the weekly payroll.

"If this keeps up, I'll soon be out of business. Lord knows I'm working my head off, but just can't seem to make it pay."

Strangely enough, this complaint is not uncommon, even in shops that appear prosperous. And almost always, the reason is the same—the shop system of pricing is all wrong! At the rates it charges for jobs, the shop's cost of doing business equals its gross revenue. Nothing is left over for profit, without which there is no reason—nor much opportunity—to stay in business.

What's happened? The shop management has failed to figure out its own labor and overhead costs; and apply them, plus a margin of profit, to the work done for its customers. Obviously, if a shop is to survive and prosper, it must set and control job prices that are fair and equitable.

Doing so requires knowing and using the facts on how to estimate a job, figure the true costs of labor and overhead, charge the price the work is worth to all concerned. Perhaps the best place to start is with the flat rates.

THE SCIENTIFIC APPROACH

Arriving at a price to charge the customer for a definite repair procedure is not a matter of grabbing a figure out of the air. It's an out-and-out mathematical process. Some groups, such as the Committee of Service Costs and Accounting Practices established a few years ago by the Automotive Trade Association Managers, have put forth much concentrated effort to establish workable rules for determining how much shops should charge for their service work performed in **their particular** places of business.

Then, too, the automotive manufacturers themselves spend a good deal of money each year "time studying" all the service operations on their vehicles. From their actual service-with-a-stopwatch come the factory **flat rate** figures. The time it takes a testing mechanic to do the actual service job is recorded in

tenths of hours or hours and tenths in the case of complex, time-consuming jobs.

To the basic figure is added anywhere from 15 to 20 per cent to take care of incidentals that are considered part of the job. These include such things as frozen bolts, stripped threads, getting the car in and out of the stall, trips to the parts department and the variance in degrees of efficiency of the mechanics themselves. All things considered, factory flat rate is an excellent guide to building an individual price structure.

Car manufacturers of course, supply the factory flat rate manuals to their dealers. This is fine as far as providing for service work on the cars that dealer sells is concerned. However, many dealer service departments do work on any and all makes and models; and so need other basic rate information. The same applies to the independent service shop, which must tackle any vehicle that's driven in.

MUST HAVE "MASS" OF FACTS

Obviously, practically every shop needs flat rate data on cars of all makes and models, from the current year back to the early '50's.

Of course, again, this information could be obtained through the automobile manufacturers. But it would amount to about a half-ton of paper to be filed, stored and used, by the time all of the factory flat rate manuals were gathered.

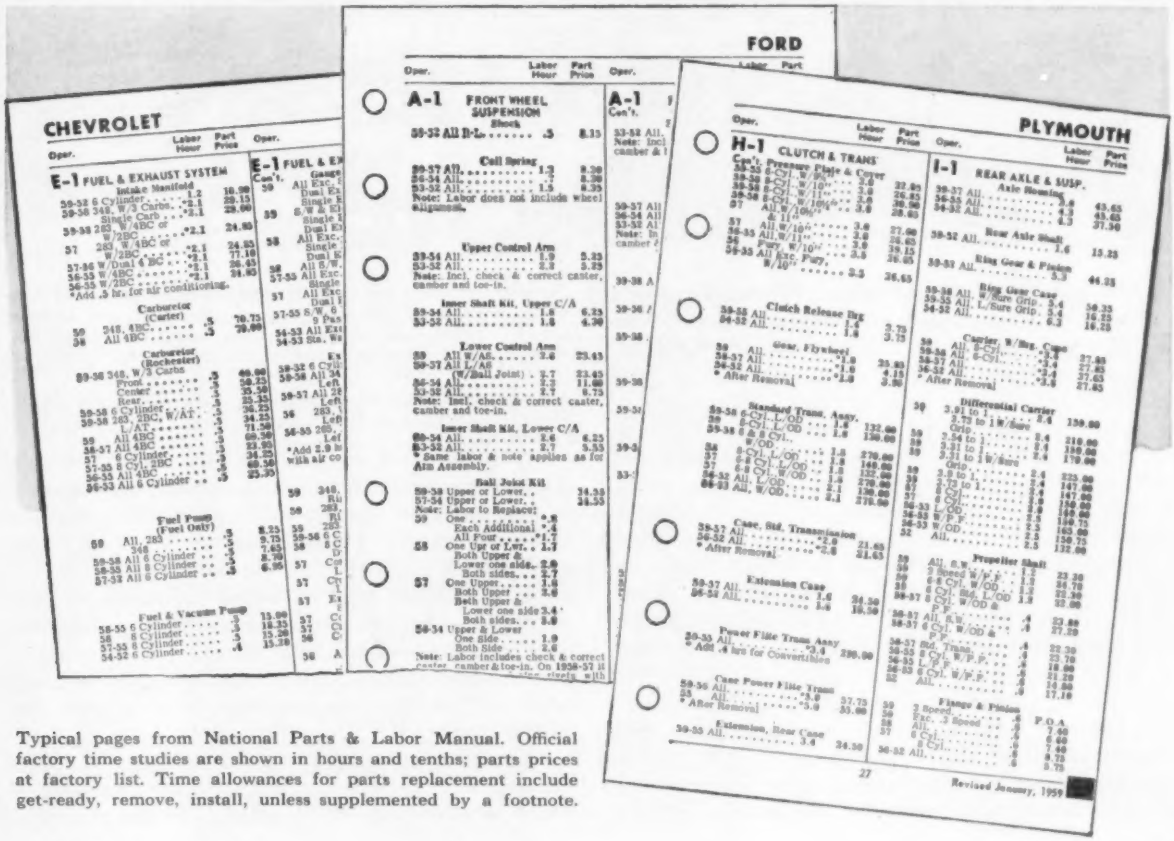
That's out of the question, naturally. So what every shop needs is a single flat rate manual that covers all makes and models, with the material indexed and easy to use. Also, the manual must be kept current by constant revisions—as new models come on the market, and some "old faithfuls" wheel the final mile to the junk yard. Such a comprehensive flat rate book should provide the correct factory data that permits dealer or independent to "figure" any job that enters the shop.

"PACKAGED" PRICING AID

Fortunately for automotive servicing, comprehensive manuals are available. The oldest and most extensively used is the **National Parts and Labor Manual**, published by our own firm, National Market Reports. Since it has been publishing informative data for the automotive trade since 1911, National Market Reports has a thorough understanding of the problems of shop operators—and their solutions. This trade insight is as completely utilized in the **National Parts and Labor Manual** as it is in the "Tech Know-How" features of ASD.

In addition to NPLM, there are two other well-known flat rate publications: **Crash**, published by the Hearst Company, and **Collision Estimator**, published by Glen Mitchell, Inc.

All three manuals provide parts prices and flat rates for all makes and models, indexed and ar-



Typical pages from National Parts & Labor Manual. Official factory time studies are shown in hours and tenths; parts prices at factory list. Time allowances for parts replacement include get-ready, remove, install, unless supplemented by a footnote.

ranged for shop use. Each also includes a revision service, to keep prices and basic time allowances completely up-to-date.

Working with a reliable flat rate manual at all times, is one of the shop's best guarantees of operating "in the black." Sound job cost estimates prevent driving the customer away by overcharging, or running the shop out of business by undercharging.

But even the soundest flat rate manual won't solve all the problems of pricing the job. It can merely provide the labor hours per job, and the cost of parts. To make full use of this information, overhead and total labor costs must be known and used intelligently.

KNOW OVERHEAD

First off, an intelligent shop owner must know **exactly** what is his cost of doing business. This doesn't mean seeing how much is left over each month after the bills are paid. It means, rather, determining how much it is going to cost to do the month's business **before** the month actually begins. It's going to cost a given amount to operate regardless of the number of cars serviced.

There are fixed costs that determine, to a large extent, the price that must be paid to open the doors each morning: heat, lights, telephone, rent, taxes, laundry, soaps, cleaning fluids, etc. These are practically the same for any given month of the year. Heating and lighting bills will vary from month to month, and from one section of the country to another; but they are averaged out and in the main can be termed fixed, along with the other constant costs.

Some fixed costs are not so easy to identify. Advertising, cost of keeping business records, goodwill expenses, warranty work on come-backs, etc., can elude the shop owner-manager if he doesn't search his overhead items closely. Also in the realm of easily overlooked overhead, can be found such items as insurance costs, licenses and permits, and the time spent selling the customer.

Selling time includes greeting the customer, gaining his confidence, and writing the repair order. Equally important is the time spent figuring up the repair bill, collecting the money, and delivering the car.

Money to pay for the time and expense of these "free" services must all come from the sale of parts and labor. Many shop operators depend upon the profit, or mark-up, on the sale of parts alone to cover the cost of doing business, the net profit of the business to come from the money taken in on paid labor.

If the mechanics, or you yourself, work on an hourly scale, it's a simple matter to figure out the actual labor cost per job by seeing how long it takes to do the work and then multiplying this figure by the hourly rate. For example, let's say the mechanic

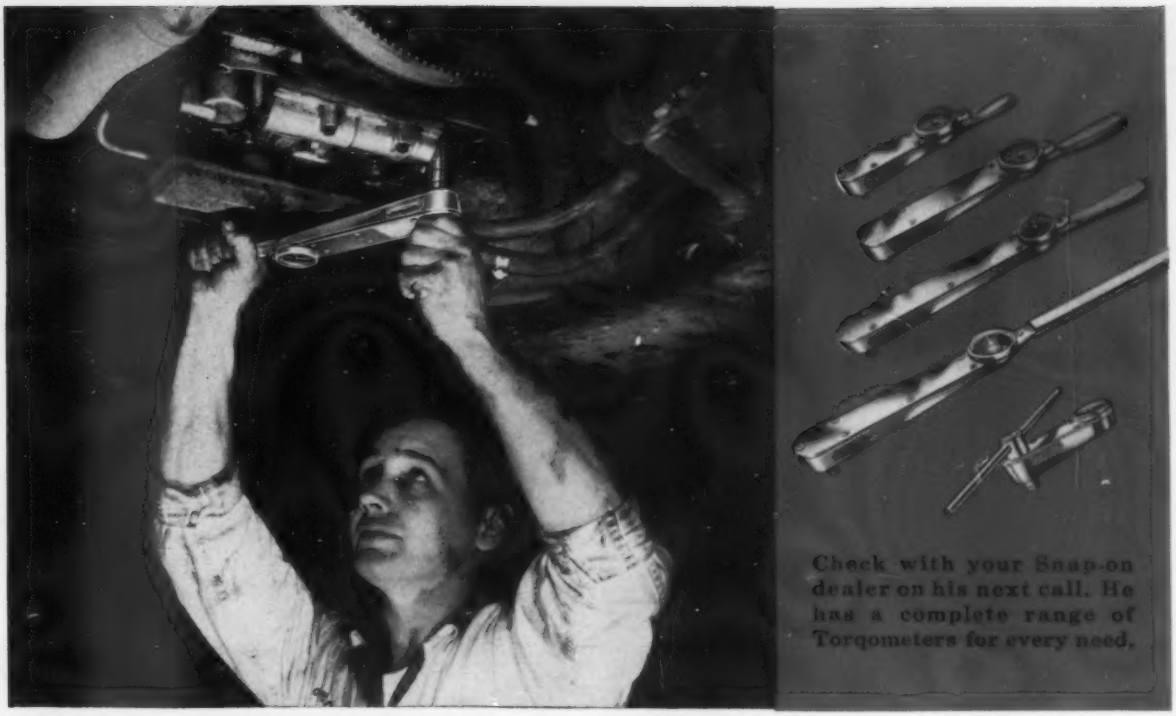
The National Parts and Labor Manual covers all makes and body styles of domestic cars for the past eight years, and includes a year's revision in the subscription price. Its Import Car Edition provides the same data for the growing new field.

gets $2.50 per hour. In comes a customer who wants a tune-up.

A quick check of your flat rate manual reveals the factory suggested time of two hours are required to perform a top quality tune up on this particular make and model. Immediately you know that you must pay the mechanic $5.00 to do the job.

To this $5.00 must be added the overhead cost per repair order. If you have researched your entire overhead for a one month period, you can divide total monthly overhead by the number of working hours per month. The resultant figure will be the hourly overhead.

Another way to figure the cost per job of doing business is to include the wages in the overhead—which is where they really belong. In the case of a



Even under the car, torquing of automatic transmissions is simple with an easy-to-read *Snap-on* Torqometer. Here mechanic checks clear-view dial to get preset reading.

Torquing by *"feel"* can ruin your reputation

PROTECT YOURSELF WITH A Snap-on® TORQOMETER®

Distortion tests by automotive engineers prove that a torque wrench is an absolute "must" for accurately servicing today's cars, tractors and trucks. Avoid complaints and "comebacks" — get all the sizes of Torqometers this work demands. You can't afford to be without them. Here's just a sample of what guesswork can do.

Automatic transmissions — Uneven torquing of transmission valve bodies can cause erratic, jerky operation. *There are over 590 manufacturer's torque recommendations on just 18 current models of automatic transmissions!*

Spark plugs — Improper torque can cause stretched or cracked threads, distorted or closed spark gap, broken shell, compression loss, poor combustion.

Head bolts — Non-uniform or overtightening can cause gasket failure, compression loss, valve damage, increased wear, poor fuel economy, early engine failure.

Bearing cap nuts — Uneven torque on the cap causes bearing distortion — can result in costly crankshaft damage.

Wheel bearings — Improper torque causes excessive wear.

And this is just part of the list!

Don't gamble with expensive components or with your customers' good will. Get the best — get a Torqometer the next time your *Snap-on* man calls. Sizes from 0 - 5 in. lb to 0 - 4,000 ft lb.

Show your *Snap-on* Torqometer to your customers. Tell them how you tighten bolts to the manufacturer's specifications. It helps build confidence in you — keeps their service business in your shop.

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Pricing the Job . . .

(Continued from page 24)

two hour tune up, the two hour cost of doing business could add up to somewhere between $8.00 to $20.00. The actual figure, of course, depends upon the total overhead, which may vary considerably in different areas of the country and under different "related" financial circumstances.

Finally, somewhere in the job estimate there must appear a very important item—profit. Ideally, there must be profit on every job. Naturally it's not always possible; but it must always be a goal. A recent study in one area of automotive servicing indicates the following: profitable work, 81 per cent; done at a loss, 13 per cent; and break-even, 6 per cent.

Any repair shop that can keep this favorable balance is assured of successful operation. Therefore, your final estimate in the tune up must include your share of icing on the cake.

How much is enough? Well, here again it depends upon how you operate. In most instances, 10 per cent of the gross makes a comfortable profit. If, as owner-operator, you include your salary as overhead, then the 10 per cent profit figure is sound. If you count profit as your salary, you'll have to do a fairly respectable gross to make out, or work on a greater margin.

CASE IN POINT

To see how an average shop can determine the actual cost of doing business, let's take a cross-sectional view of a typical service operation. Bear in mind that this is only a "for instance" and not a cast iron rule to be applied in all cases. All figures below are per hour:

Labor Costs:	Mechanic's Wages	$2.00
	Unsold Labor Time (based on 1 year)	.45
	Paid Holidays and Vacations	.10
	Social Security Tax (2% of payroll)	.04
	Unemployment Insurance (State and Federal)	.045
	Workman's Compensation (1.2% of payroll)	.018
	Group Hospitalization (Employer's Contribution)	.02
Total Cost Per Man Per Hour		$2.673

As this indicates, the cost per man is $2.67 an hour. The same kind of breakdown into cost per hour can be made for other fixed expenses that constitute total overhead. Then, tack on the percentage necessary to enable the business to operate at a fair profit, and the final figure is the hourly rate of shop operation. In most cases this total figure will balance out around $4.50 to $5.00 per hour. This, then, is the figure to be applied to the flat rate scale for your particular business.

Now, when a customer comes into the shop requesting a specific service operation, the factory flat rate for the particular job can be easily and quickly looked up in the **Flat Rate Manual.** Let's assume the book calls for 1.9 hours. This figure is recorded on the repair order then it is converted to dollars and cents by using the scale provided in the back pages of the manual. Again assuming the particular shop rate is $4.50 per hour, the price of the job turns out to be $8.55.

THAT'S the fair price. The factory has told you, through the **Flat Rate Manual**, exactly how long it should take to do the work. (Incidentally, you've checked out a few examples against your own mechanics and equipment—to catch any peculiarities of your shop, which could affect the "times.")

Your analysis tells you how much your shop must take in per hour. When both of these key factors—time and cost per hour worked—are intelligently established, the price is RIGHT. The customer isn't being overcharged, and the shop isn't operating at a loss.

"Dished" Spark Plug Ground Electrode Good Indication of Reversed Polarity

A surprising number of vehicles on the road today are being driven with the coil polarity reversed, generally due to an incorrect hook-up of the coil primary leads. The result is reversed direction of the flow of voltage to the spark plugs, along with an increase of required ignition system voltage by as much as 35 to 45 per cent.

Among the several ways of checking for reversed polarity, probably the quickest involves the simplified "one plug check" method recently announced by Champion Spark Plug Co. Take a look at the electrodes on one of these plugs. This won't *always* work, but is usually quite reliable once you get in the habit of looking for it. Notice whether or not the ground electrode is "dished." If it is, and the center electrode shows little wear and has relatively sharp edges, it's a good indication that polarity is reversed. You can double check it in one of the following ways. Then, in a matter of seconds, you can improve the performance of your customer's car by installing the primary leads on the coil correctly.

Other ways of checking for reversed polarity in addition to the electrode erosion pattern are:

Oscilloscope: wrong polarity is indicated by upside down pattern.

Coil testers: most coil testers provide for checking polarity. Instructions are in the operator's manual.

High-reading voltmeter: ground the positive lead and touch the negative lead to the spark plug terminal. Wrong polarity is indicated by the needle trying to swing down scale.

Pencil: insert the point of a **wooden** pencil into the spark between the ignition lead and the plug. If the spark "feathers" toward the lead, polarity is wrong.

Check—and you'll be amazed at all the profitable volume you can add by dispensing brake fluid...

Every time you check the lubricating oil on a car—take a look at the brake fluid in the master cylinder. You'll find many cars either need additional fluid or need to have brake system drained, flushed and refilled.

You...and your customers...gain when you supply Wagner Lockheed Brake Fluid. You can use this top-quality heavy duty fluid with complete confidence. Your reputation will be safe—and the customers you serve will be safer.

NEW HANDY DISPENSER (of type illustrated at right) makes it a fast and easy operation for any mechanic to pump fluid directly from a one-gallon can of Wagner Lockheed Brake Fluid into any master cylinder.

This Dispenser is handy to use anywhere. One pull on handle and release, and you have finger-tip control in adding fluid.

SPECIAL OFFER (subject to change or withdrawal without notice) enables you to get this Dispenser—at a greatly reduced cost to you—when you purchase 5 one-gallon cans of Wagner Heavy Duty Brake Fluid. Ask your supplier for details.

A WAGNER FLUID-BAL will prove to be a great aid in helping you bleed brake systems and dispense brake fluid.

With it, bleeding and refilling the brake system becomes a one-man operation. Even though a car is raised off the floor, the mechanic does not have to climb in and out of the hoisted car, and he doesn't need a helper.

Flushing out a brake system will help avoid the kind of trouble that often causes clogging of parts, sticking valves, leaking and scored cylinders and faulty brake action.

Wagner® Lockheed
HEAVY DUTY BRAKE FLUIDS
have all these features and advantages:

- Surpass SAE Specifications.
- Conform to Federal Specifications.
- Are proved by tests to be the best fluids in their price ranges.
- Are chemically balanced to make an all-season fluid that maintains high operating temperature characteristics, yet functions in sub-zero temperatures.
- Provide proper lubrication to all parts of the brake system.
- Have exactly enough moisture-absorber so that metal parts of brake system will not rust or corrode.
- Do not cause rubber cups or hose to swell.
- Form no gummy residue.
- Do not evaporate rapidly.
- Packaged in 12 oz., quart, gallon, 5, 30 and 54 gallon containers.
- Produced in Wagner's own factory—the largest and most modern plant in the world devoted to the production of brake fluid.

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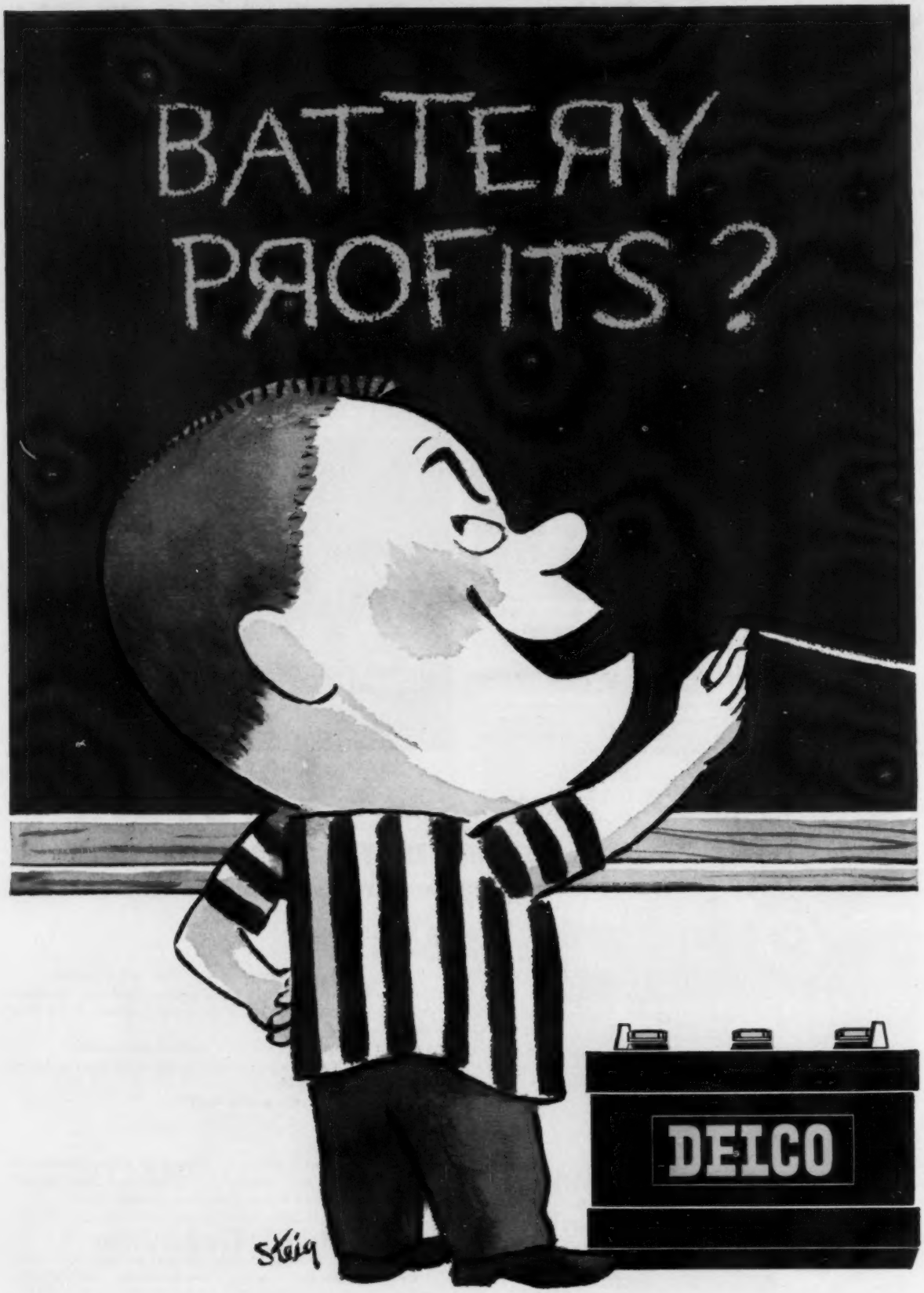
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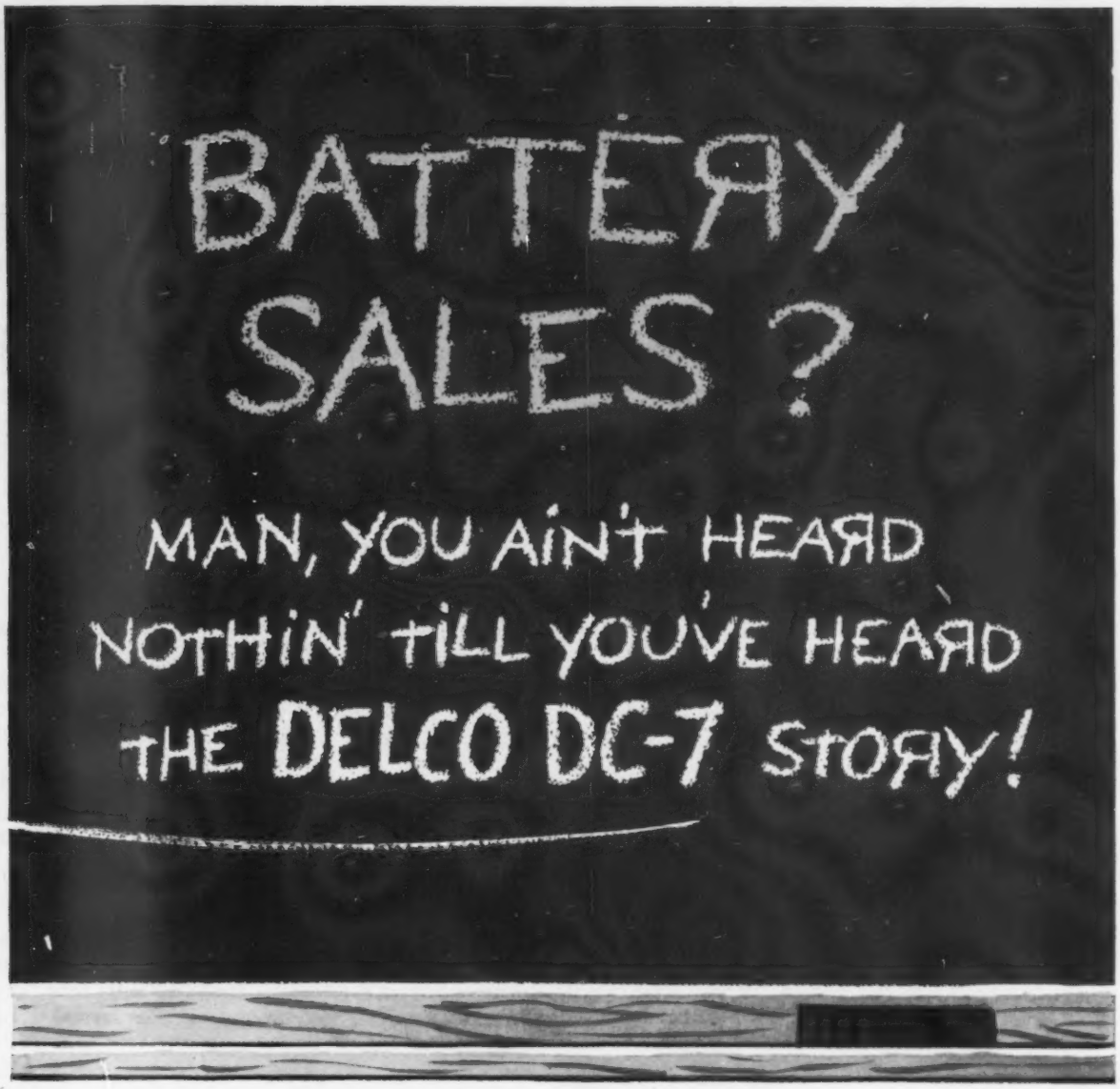


TALK ABOUT PROFITS! The new Delco DC-7 gives you price appeal *plus* substantial profit. The price structure of both the 6-volt and 12-volt DC-7 is set up to give you, the dealer, a more substantial profit than the next five well-known brands of batteries. Don't be misled on battery profits—get the real story on a real profit-maker from your Delco battery distributor.

TALK ABOUT SALES! Almost half the cars on the road come factory equipped with Delco. It's natural for owners to replace with the same brand. Nearly 25,000,000 replacement batteries are sold each year—and you'll increase your share of sales with the Delco line. Delco is backed with the strongest advertising and sales promotion campaigns in the business. And like all Delco batteries, the DC-7 carries a General Motors warranty that's good all over the United States and Canada. *PRICE, PROFIT and CONSUMER PREFERENCE, YOU'VE GOT 'EM ALL WHEN YOU HANDLE THE DELCO LINE INCLUDING THE NEW DC-7.*

Quality built by Delco-Remy, distributed nationally through GM U-M-S PARTS SALES UNITED MOTORS SYSTEM *General Motors STARTS with Delco Batteries*

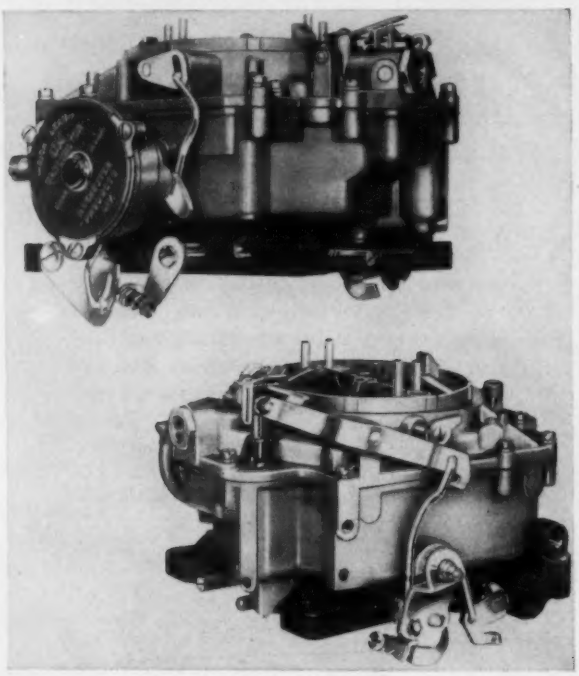
Rochester's Model 4GC carburetor

Carburetor work requires familiarity with the five lines currently used on domestic cars—each car manufacturer using two or more interchangeably as a matter of policy. Here's the inside story on the four-barrel carburetors used in the 1959 G.M. line . . . the dependable hearts of its fuel system.

• THE VARIOUS FOUR BARREL carburetors in current use all depend on the same general principles for their operation. However, there are differences in the arrangement of the circuits or systems, in the air bleed locations, in the cut-in of the power system and in the arrangement and cut-in method used for activating the secondary barrels. It is quite helpful to the men who service carburetors to know and understand how these units work in order to find trouble quickly and to service them efficiently.

The Rochester Model 4GC carburetor is used, with slight modifications, on all General Motors cars furnished with engines that can use such a unit to advantage. Its design has been kept basically simple for servicing ease. Most of the calibrated metering parts are contained in the venturi clusters, located in the float bowl, and may be easily serviced by removing the air horn assembly.

Choke side and accelerating pump side of the Rochester four-barrel Model 4GC carburetor, which, with slight modifications, is used on all G.M. cars furnished with engines that can use such a unit to advantage.



The idle tubes and main discharge nozzles are pressed into the venturi clusters, so they do not need to be serviced separately. The power restrictions and pump jets are also pressed in place at the factory so that their individual replacement is not necessary. All field adjustments have been kept as simple as possible, and the special tools and gauges for ease in servicing this unit have been kept to a minimum.

BASICALLY TWO DUAL UNITS

The 4GC consists basically of two dual carburetors, which will be referred to as the primary or pump side and the secondary or fuel inlet side. The primary side completely controls the metering of fuel to the engine throughout the idle and part-throttle range. The fuel from the primary side is supplemented by fuel from the secondary side throughout the power or wide open throttle range.

This carburetor makes use of the six basic systems or circuits of carburetion, which are: idle system, part throttle system, power system, accelerating system, float system, and choke. All of these systems are included in the primary side, while on the secondary side there is an idle system which discharges into the primary side, a power system, and a float system. The secondary throttle valves are controlled by the primary side throttle opening, through a series of linkages. This, by increasing air flow at high vehicle speeds, proportionately increases the breathing capacity of the engine.

THE IDLE SYSTEM

At idle speed, with its small throttle opening, the vacuum created at the main discharge nozzles is not great enough to cause fuel to flow from these noz-

zles. Therefore the idle systems have been introduced to provide fuel at the correct mixture ratio to make the engine run satisfactorily at low speeds. Two idle systems are provided in each half of this four barrel carburetor. A fixed idle system is located on the secondary side, which provides about half of the fuel required for normal curb-idle mixtures. The secondary idle fuel is drawn from the float bowl (through the main metering jet), into the fuel well in the bottom of the float bowl. It then passes through the calibrated restriction in the end of each idle tube. The fuel is then drawn up through the idle tube in the secondary float bowl, is bled at the idle bleeds, passes through the calibrated restriction and is again bled by the calibrated air bleeds. This mixture of fuel and air is then drawn around the secondary body bore through a channel in the float bowl, further bled, and discharged into primary barrel.

View of the Model 4GC with air horn removed, showing primary venturis and venturi cluster.

In addition to the secondary fixed idle system, there is a primary idle system, provided on the primary side of the carburetor, which is adjustable by means of a needle valve. This system provides the balance of fuel required for normal curb idle as well as for the off-idle low speed range. In this system, the fuel follows a similar path, from the primary float bowl into the fuel well in the bottom of the float bowl, past the several air bleeds, through the calibrated restriction, more air bleeds, and is discharged past the adjustable needle valve into the carburetor bore. As the throttle is progressively opened, the bleed effect of the secondary idle holes gradually diminishes, and when they become exposed to manifold vacuum they then become fuel discharge holes to meet the increased demands of the engine.

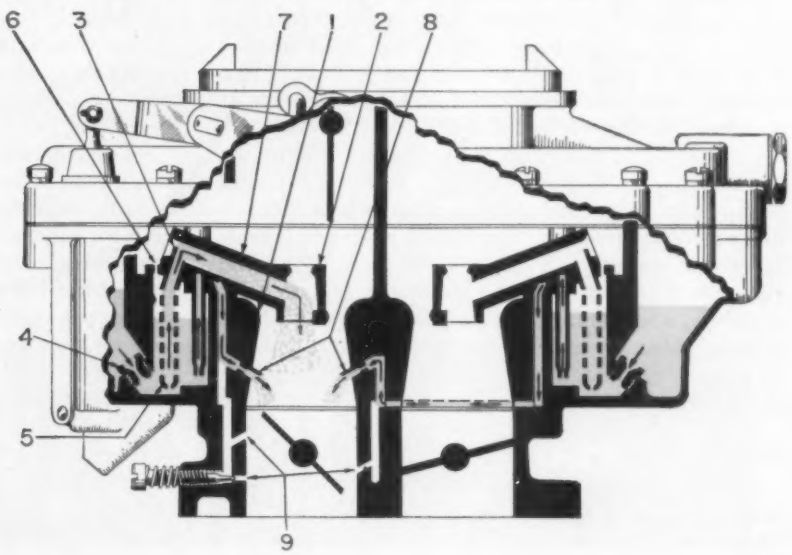
To minimize the effects of hot weather on starting or rough idle due to fuel vapor formation, an external vent is incorporated, when the throttle valves are in closed position. This external vent consists of an actuating lever attached to the pump shaft and lever assembly, idle vent valve guide, idle vent valve spring, and idle vent valve. When the throttle valves are closed, the actuating lever contacts the spring loaded vent valve and holds it open, permitting vapors from the float bowl to vent themselves to the atmosphere. When the throttle valves are opened, the vent spring closes the idle vent valve, eliminating the atmospheric vent and returning the carburetor to its normal internal balance.

PART THROTTLE SYSTEM

As the throttle valves are opened beyond the point where the idle system can supply sufficient fuel, it is necessary to have some other means of supplying the fuel requirements of the engine. This is the function of the Part Throttle System.

By GUY F. WETZEL

Technical Editor



Part Throttle System:
1. Primary venturi
2. Secondary venturi
3. Main discharge nozzle
4. Main metering jet
5. Main well tube
6. Main well air bleed
7. Mixture passage
8. Idle discharge nozzle

At part throttle opening, there is sufficient air flow through the carburetor primary bores to create a vacuum at the throat of the compound venturi. This vacuum creates a pressure differential between the tip of the fuel discharge nozzle and the surface of the fuel in the float bowl. This pressure differential or suction draws fuel from the float bowl through the main metering jet into the air bleed main well tubes, past several air bleeds, through the mixture passage, into the secondary venturi and then into the carburetor bore, past the throttle and into the intake manifold.

As the throttle opening is progressively increased and more fuel is drawn through the main well tubes, the fuel level in the main well drops. As it does, calibrated holes in the main well tubes are uncovered of fuel and become air bleeds progressively mixing more air with the fuel passing through the main well tubes. Thus, although the nozzle suction is increased by increasing the throttle opening the fuel mixture to the engine remains constant throughout the part throttle range.

As throttle opening increases, the lower idle system air bleeds become part throttle fuel feed nozzles, discharging fuel into the stream of fuel-air mixture coming through the venturis. As they are exposed to vacuum during part throttle operation these nozzles draw fuel through both primary and secondary idle systems. Remember that these same nozzles act as air bleeds during operation of the idle systems.

The throttle valves on the secondary side of the carburetor do not open until the primary linkages engage the secondary throttle shaft when the primary throttles are more than two thirds open. Therefor, the secondary side only supplies fuel in the idle and power ranges, with the secondary idle actually supplying the primary side and then only while the engine is running on the idle systems. The part throttle or intermediate range is controlled completely on the primary side of the carburetor.

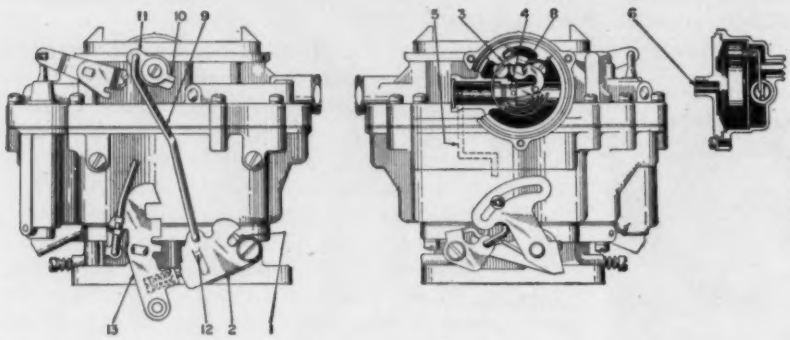
POWER SYSTEM

When more power than the usual running power is required, due to fast acceleration, climbing a long steep hill, or pulling a heavy load, it is necessary to enrich the fuel-air mixture. The Model 4GC carburetor uses a vacuum actuated power piston in the air horn which in turn operates a power valve in the fuel bowl. This power system is located on the primary side of the carburetor.

The power piston vacuum channel is exposed to intake manifold vacuum beneath the throttle valves so that the vacuum in this channel varies directly with the manifold vacuum. In the idling and part throttle ranges the manifold vacuum is normally quite high, and is sufficient to hold the power piston in its extreme up position. However, as the throttles are progressively opened, the manifold vacuum drops. When the vacuum drops below approximately 7 in. Hg, the calibrated spring above the power piston forces the piston down. When this occurs, it opens the spring loaded power valve, permitting additional fuel to flow from the float bowl through calibrated restrictions and into the main wells. This additional fuel supplements that already flowing through the main metering jets, making the fuel air mixture being delivered to the intake manifold considerably richer than the part throttle mixtures. This enriched mixture continues to be supplied as long as the manifold vacuum continues to be below approximately 7 in. Hg. When manifold vacuum again increases sufficiently, the force of the power piston spring is once more overcome and the piston is drawn up, closing the power valve and returning the carburetor to the economical part throttle mixtures.

The secondary side of the carburetor can also be considered to be included in the power system of the unit, to provide additional fuel and air to the engine for increased power. For high speed operation, beyond the part throttle range, the throttle linkages engage the secondary throttle valves and open them completely in the remaining few degrees of primary throttle travel (after the secondary throttles start to open).

With the secondary throttles open, vacuum generated in the venturis draws fuel through the secondary main metering jets, past the various air bleeds, and through the mixture passage to the secondary venturi, where it is discharged into the air flowing to the intake manifold. The lower idle air



Choke System

1. Throttle shaft lock-out lever
2. Fast idle cam
3. Thermostatic coil
4. Vacuum piston
5. Vacuum channel
6. Thermostatic coil housing connection
8. Choke valve shaft
9. Choke rod
10. Choke trip lever
11. Collar assembly
12. Fast idle cam tang
13. Throttle lever

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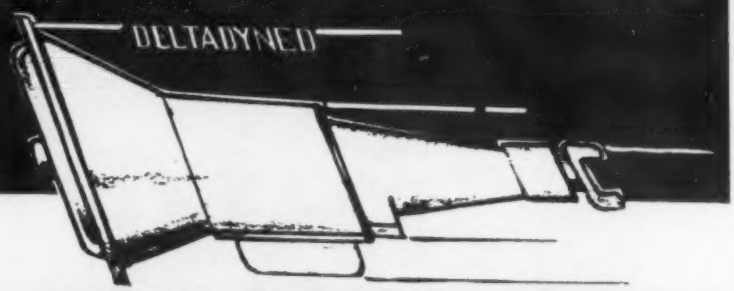
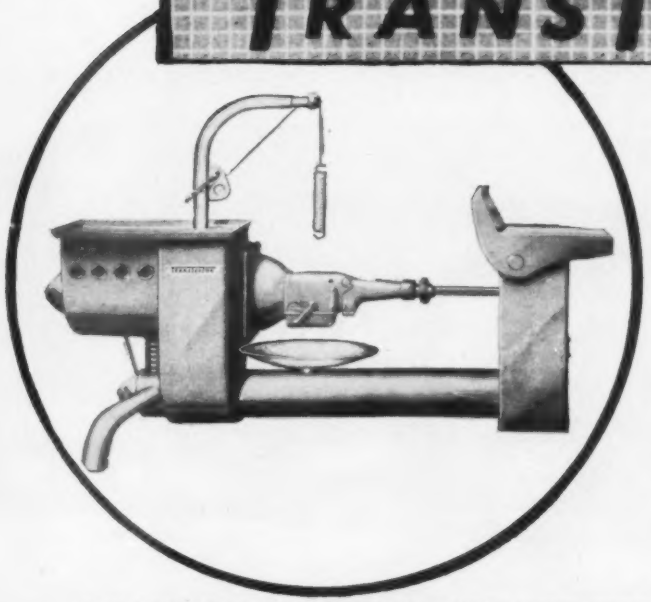


TRANSTESTOR



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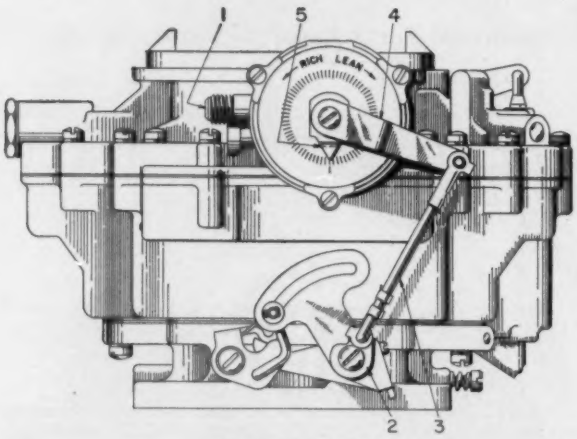
bleeds also supply fuel throughout the power range in a manner similar to that described under Part Throttle System operation.

ACCELERATING PUMP SYSTEM

During the transition from the idle system to operation on the part throttle system, there is a flat spot which would be quite annoying, if not taken care of. When the throttle is opened rapidly, the air flow and manifold vacuum change almost instantaneously, while the heavier fuel tends to lag behind, causing a momentary leanness in the air-fuel mixture. To offset these conditions, the accelerator pump system is provided in accordance with the general practice in American carburetor design.

As the throttle valves on the secondary side of the carburetor remain fully closed throughout part throttle operation, it is only necessary to have accelerator pumps on the primary side. The 4GC Carburetor uses a double spring pump plunger. The rates of compression of the top spring versus the bottom spring are carefully calibrated to insure a smooth and sustained charge of fuel on acceleration.

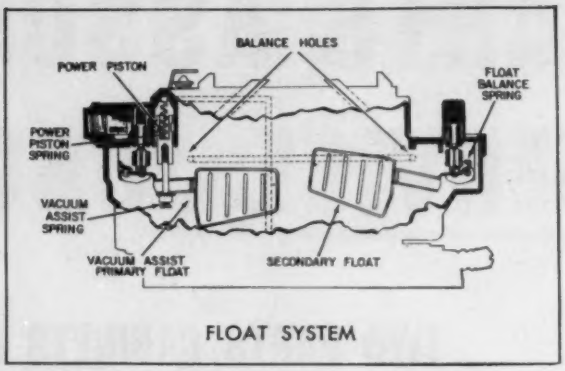
On the pump intake or up stroke, fuel from the float bowl passes through the pump filter screen, unseats the aluminum inlet ball check, and fills the pump well. The accelerator pump is connected through suitable linkage to the throttle shaft and moves with the slightest change in throttle opening.



Choke Modifier
1. Thermostatic coil housing connection
2. Throttle shaft modifier lever
3. Choke modifier rod
4. Thermostat modifier lever
5. Index plate

Each time the throttle is moved in the opening direction, fuel is forced through the discharge channel, past the discharge needle check, and out the pump discharge nozzle, into the main air stream.

The carburetor is vented twice in its accelerating pump system. The pump plunger is vented to minimize the effect of fuel percolation in the float bowl



Arrangement of the vacuum assist on the primary floats.

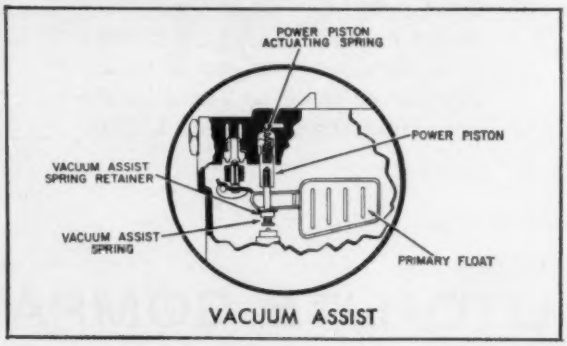
pump well. There is also an atmospheric vent located in the primary venturi cluster in the channel above the pump discharge nozzles. Upon sudden acceleration, the force of the fuel past the outlet needle seats the valve in its "up" position, thus preventing the discharge of fuel through the vent passage. This vent valve utilizes suction at the pump nozzles by progressively increasing the force tending to hold the outlet needle on its seat with each increase in throttle opening. This prevents a condition known as pump pullover or a discharge of fuel from the pump jets during high speed operation.

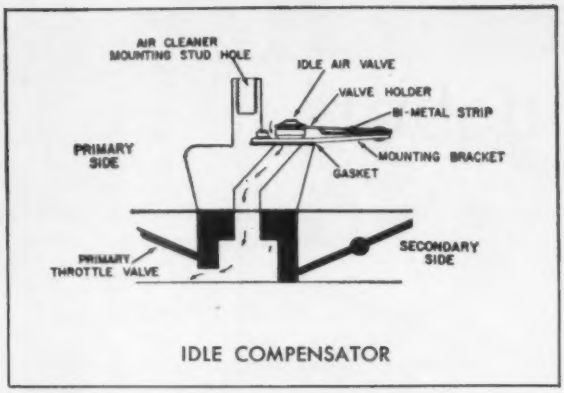
FLOAT SYSTEM

The 4GC Carburetor makes use of two sets of twin floats to aid in maintaining the correct fuel level under all conditions of operation. Both sides of the carburetor use individual float systems for maintaining the proper fuel level in each float bowl. All fuel enters the carburetor on the secondary or fuel inlet side. As the fuel drops on the secondary side the twin floats also drop, moving the inlet needle off its seat. Then pressure from the fuel pump forces fuel through the filter screen, into the inlet passage and into the float bowl. As fuel is drawn from the fuel bowl on the primary side of the carburetor, the float action is identical with that of the secondary float. While the fuel enters the carburetor on the secondary side, each side has its own float bowl, each with its own float system, including float needle valve.

Both float systems are provided with float needle

Enlarged view of the vacuum assist mechanism.





Details of the Idle Compensator. Note the bi-metal strip.

pull clips and float balance springs. The float needle pull clips link together the twin floats and inlet needles to positively retract the needles when the floats drop. The balance springs act as vibration dampers and enable the carburetor to maintain a more uniform and accurate fuel level.

Both sides of the carburetor are individually and internally vented. The vents transmit pressure from beneath the air cleaner to the fuel in the float bowl. On the models used on 1959 Buick, Cadillac and Oldsmobile, a vacuum assist is used on the float to provide more positive closing of the fuel inlet needle under normal driving conditions by giving added buoyancy to the floats. The vacuum assist spring is mounted on the power piston stem and exerts pressure on the primary float arms when the power piston is in the full "up" position, adding buoyancy to the floats during off-idle and part throttle operation.

Under load or heavy acceleration, when the power piston drops down due to lowered vacuum, all spring pressure on the float arm is released, allowing the primary floats to drop down freely for maximum fuel flow through the needle valve into the float bowl. This improves overall operation by effecting more positive closing of the primary fuel inlet needle and maximum float drop on acceleration.

CHOKE SYSTEM

The 4GC carburetor makes use of a fully automatic choke to insure proper starting and operation during cold engine operation. Choking is only necessary on the primary side of the carburetor because the secondary throttle valves are locked in the closed position whenever the choke valve is even partially closed. A lock-out lever provides for this.

The choke system consists of a thermostatic coil, vacuum piston, offset valve and fast idle cam. Its operation is controlled by a combination of intake manifold vacuum, the offset choke valve, atmospheric temperature and exhaust manifold heat. During engine warm-up the vacuum piston serves to modify the choking action to compensate for varying loads or acceleration. Any acceleration or increased load decreases the vacuum exerted on the choke piston, which allows the thermostatic coil to momentarily increase the choke valve closure and slightly enrich the fuel-air mixture.

To prevent stalling during the engine warm-up period, it is necessary to run the engine at a slightly higher idle speed than for an engine at normal operating temperature. This is accomplished by the fast idle screw which rests against the steps on the fast idle cam. The fast idle cam in turn is linked to the choke valve shaft, and holds the throttle valves open sufficiently during warm-up to give the desired higher idle speed.

As the engine warms up, hot air from the exhaust manifold is drawn into the thermostatic coil housing, which slowly causes the coil to lose its tension and allow the choke valve to move into its wide open position.

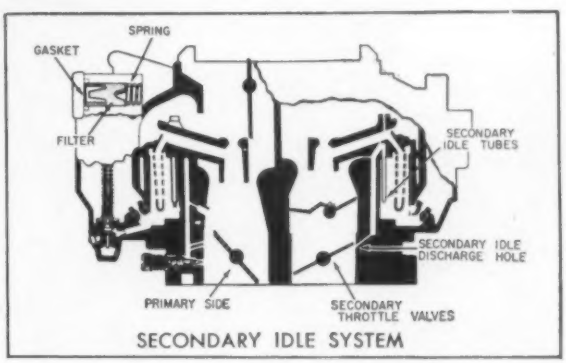
While the automatic choke is in operation, there may be some cases where the driver may wish to advance the throttle to wide open position. As this would decrease the pull on the vacuum piston which holds the choke open while the engine is warming up, and would close the choke valve, it is necessary to provide increased air flow by opening the choke valve mechanically. This is done by having a tang on the fast idle cam which is made to contact the throttle lever at wide open throttle position so as to sufficiently open the choke valve. This is also called a choke unloader and serves to de-choke a flooded carburetor during cold starting operation. It will also relieve a flooded condition on starting by allowing more air to enter the carburetor and mix with the excess gasoline in the manifold whenever the engine is cranked with the accelerator fully depressed.

CHOKE MODIFIER

The choke system, as used on some Model 4GC carburetors also incorporates a choke modifier. Its purpose is to prevent certain engines from "loading up" or having excessively rich mixtures during the warming up period. Under normal operating condi-

(Continued on page 46)

Latest arrangement of secondary idle system, discharging into secondary barrel. Note auxiliary throttle valve in secondary barrel.



Oriental beauty debuts

• NOW MAKING ITS BOW in the U.S. imported car market, the Toyopet Crown Custom was introduced at the International Automobile Show in New York last month. According to its manufacturer, Toyota Motor Company, which is Japan's oldest and largest producer of passenger cars, taxicabs, trucks and busses, Toyopet brings the American market the quality of luxury traditionally associated with the Orient.

Style leader of the firm's line of family cars, it features deep pile carpets, foam rubber seats, hardware and bumpers of sparkling chrome. The name is a combination of "Toyo," the Japanese word for Orient, and "pet"; so that the literal translation is "pet of the Orient." The car is a compact, six-passenger vehicle originally designed to withstand the bumps and ruts of Japan's roads, which are 85 per cent unpaved.

With box-frame construction and torsional bracing, it has total weight of 2,680 pounds, and is described as virtually rattle- and squeak-proof. Toyota Motor claims the car will display ground-hugging safety on any kind of road, and speed up to 80 miles per hour.

Toyopet's "opulence" theme carries into special safety precautions, including red safety lights to warn occupants when any door is ajar, and a red light to signal that speed exceeds 50 miles an hour. In addition to white sidewalls and heater-defroster, an array of more than 30 options is offered.

The interior is described as custom craftsmanship in quality, so perfectly fitted that even the trunk is proof against water leaks in a downpour. Upholstery is deep-pleated vinyl, with vinyl headliner.

PARTIAL SPECIFICATIONS

ENGINE: 4-cyl. OHV, liquid cooled; 3.03-in. x 3.07-in. bore and stroke; 88.67 cu. in. displacement; 8.0:1 compression ratio; 65 b.h.p. at 4,500 r.p.m.; maximum torque, 83.6 ft. lb. at 3,000 r.pm.

FUEL SYSTEM: down-draft two-barrel carburetor; diaphragm type fuel pump driven from camshaft; gasoline filter.

TRANSMISSION: single dry plate with rubber torsion dampers, hydraulic type pedal; gearbox, three forward speeds, synchromesh in second, third, and reverse, steering column shift; semi-floating rear axle.

BRAKES: 4-wheel hydraulic, internal-expanding type, double-cylinder front brakes.

ELECTRICAL SYSTEM: 12-volt; generator rating 216 w.; 12-volt starter motor; 55 a.h. battery.

SUSPENSION: front—independent coil spring and wishbone, double-acting tubular shocks; rear—semi-elliptic springs, double-acting tubular shocks.

LUBRICATION: full-pressure feed to all main and connecting-rod bearings, camshaft and timing gear; gear-type gear-driven oil pump; treated paper oil filter.

DIMENSIONS: wheelbase, 99.6 in.; overall length, 171.9 in.; overall height, 60.2 in.; overall width, 66.8 in.; front tread, 52.2 in.; rear tread, 53.94 in.; ground clearance, 7.4 in.; tires, 6.40-13.

FRAME: girder type, closed box section.

Described as the "most luxuriously appointed automobile in the economy-priced field," Toyopet Crown Custom has a basic Port of Entry price of $1,999. Its richly finished body is "a steel shell within a steel shell" construction, totalling 2,680-lb. and moved at about 80 m.p.h. by its four-cylinder engine. Fuel economy is in the picture, as well as "jewel and silk opulence," with reported performance of 33 miles to the gallon.

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According to all reports, car owners object far more to sloppy work than to high price for a good job. The key to loyalty seems to be quality workmanship. For the "secret" of winning and holding happy customers, it might be worth looking into your shop's . . .

Craftsmanship in action

• LIKE MOST DESIRABLE things, automotive craftsmanship enjoys the approval of practically everyone. Nobody disputes its value . . . nor that it is a basic "must" in servicing the highly-engineered modern car. In fact, it's probably safe to say that most shops are eager to claim this type of top quality for their own work.

Yet judging from the experiences of many motorists, a good deal of the nation-wide devotion to craftsmanship can't be much more than "lip service." There is no other logical explanation for the common shortcomings in service work. However, it is possible that a good deal of the poor workmanship is due—at least in part— to honest misunderstanding about the true requirements of automotive craftsmanship.

It is a demanding "way of life" in service work . . . one that must be constantly remembered and followed. Enthusiasm for good standards is fine, as far as it goes—but it's a generality. Actually putting these standards into the shop's work means getting down to cases in job-by-job practice—every job, every day.

Constant effort and attention are needed to turn the trick. A few examples of the role of craftsmanship in typical shop jobs will quickly point up the difference between the "real McCoy" and the "fair weather" type of devotion to top standards in automotive service work.

TUNE-UP AND TROUBLE-SHOOTING

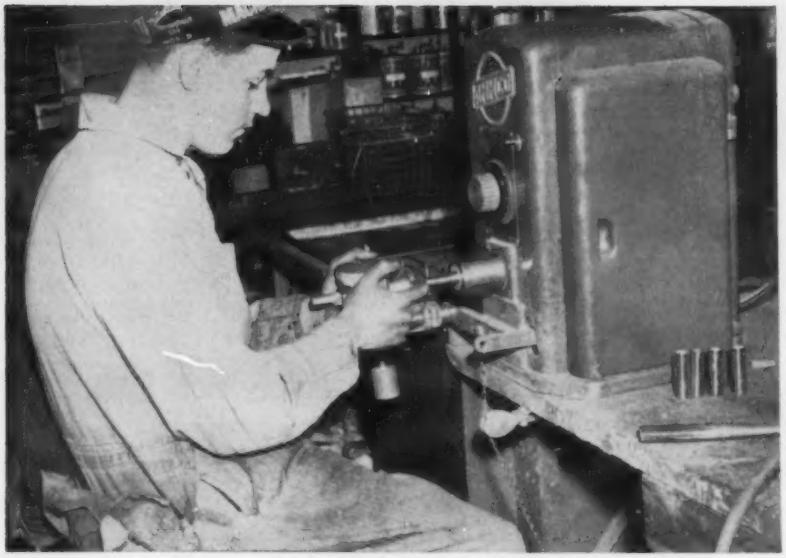
Craftsmen tackle these with modern test instruments. The craftsman fully appreciates the value of voltmeter, ammeter, dwell meter, distributor tester, etc., used singly or in a test set. They are his route to faster, surer location of troubles, to accurate identification of the causes, to determination of the kind of work needed. Once these things are known, correcting undesirable conditions is largely a routine matter.

But routine with craftsmanship differs greatly from the well-known "quick and dirty" tune-up, in which spark plugs are replaced whether necessary or not, and distributor points are "thrown in" on the job. Quality work standards dictate careful servicing and re-installment of plugs or other units that still "have a lot of life left," provided the required labor is not more costly than a new part, of course.

Further, the craftsman uses meticulous care in every step of his work . . . follows exactly the recom-

By GUY F. WETZEL
Technical Editor

To an "old pro," nothing but "just right" is satisfactory in front end alignment. It takes detailed knowledge of front end geometry, ability to use aligning gear, and the craftsmanship approach.



Jobbers shops are among the establishments maintaining top standards in service work. Jobs that they do for car dealer and independent shops have to be as nearly perfect as mechanical skills can make them. Here, a jobber craftsman hones piston pin holes.

mended procedures . . . is particularly careful about cleanliness. He knows, for instance, how important it is to keep new distributor points clean—the slightest amount of foreign matter on their surface can shorten their service life considerably. Carbon, oil or grease—none of them good electrical conductors—will hamper the conduction through the points, and contribute to ignition system trouble. As far as the "minor" job of installing new points is concerned, the mechanic who does top quality work also knows how—and why—to align and adjust the breaker arm and fixed point supplied for older engines. He's not limited, in ability, to doing a good job only on the pre-aligned sets for newer models.

"PUTTING IT ON THE LINE"

When it comes to real trouble-shooting, it takes a thorough mechanical craftsman to make a complete power plant diagnosis . . . and follow up with the required work. The various systems of the modern car have to be checked out thoroughly and accurately with the proper instruments . . . a written report must be prepared, setting out the test results, the problems found, the work and parts needed. Nothing can lose a customer faster than "goofing" on this kind of a major job.

Once the customer has "bought" the shop's analysis and recommendations, both the mechanic and his management are up against the "acid test." Within practical limits, the trouble-shooting has to have been "right on the button" if the shop is to get its "labor's worth," plus a fair profit, out of the quoted price. If it's necessary to "cheat" a bit, chances are good that the customer will be unhappy with the result. Thus the presence or absence of craftsmanship shows up on major work as a profitable or unprofitable job, and a happy and loyal, or dissatisfied car owner. Even if pure chance were to guide the mechanic's hand so that he did nothing actually wrong, the things he didn't do right would make the difference.

ENGINE WORK

Here too, there's no room for deviations from correct procedures. Accordingly, craftsmanship is again the key to satisfactory results from both shop and the customer viewpoint. Work on the pistons and cylinders, bearings and valve train, has to be done strictly "according to the book," and many long recognized niceties must be observed. Again, dirt is a leading villain—and cleanliness in every tiny detail, the only effective answer.

One speck of dirt .001 in. in size, for example, can ruin a bearing completely. The least it would do is shorten service life drastically—possibly enough that the job comes back for rework. Every craftsman recognizes the damage that abrasive dirt does to smooth metal surfaces, and acts accordingly. There's no substitute for this "must."

Accuracy is equally important, and only a first-rate mechanic really appreciates the reasons. Engineering has established clearances and tolerances, between cylinder wall and piston, piston ring and ring groove, journal and bearings, for instance. When they are followed faithfully, the engine is in the best possible condition for operation at its best. To the craftsman, finding and following the clearance and tolerances is automatic.

He installs parts with precision and care, and in exactly the right position. His background of conscientious work at the highest possible standards has taught him many invaluable basics. He knows that when more than one position is possible, the numbered side of connecting rods goes toward the camshaft; that the numbers on rods and bearing caps correspond and go on the same side of the journal.

"KNOW-WHAT" SHAPES JOB OUTCOME

On his jobs, rings are never put on pistons without being first checked for size and end gap. Each ring is pushed down in the cylinder (with an upside down piston as a pusher to keep the ring square with the cylinder center line) as far as it will travel in normal use. A suitable ring expander is used to ease the ring over the piston and to its correct groove. Ring side play in the groove is checked; and if necessary the groove is cut out and a steel side rail inserted to bring it back to the correct size.

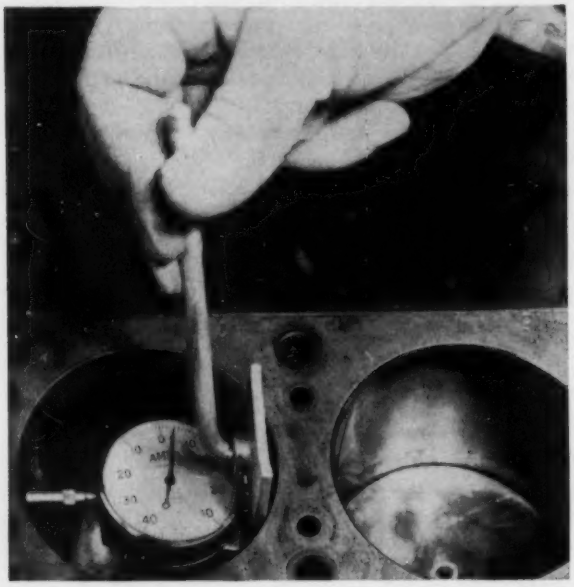
What chance can there be of satisfactory work if the shop's mechanics don't know, or simply do not practice, essentials like these?

They must also understand and provide "bearing crush"; must know how to insert a piston-ring-rod assembly into a cylinder, using plenty of engine oil, stopping and making corrections if there is the slightest catch. This list of the basics could be extended for many pages.

Finally, the "buttoning up" operation imposes all the same requirements of precision, cleanliness, exact procedure. This is the point at which all the painstaking work that went before can be quickly and completely wasted. Particularly when some of the specialized work has been "farmed out" and done in another shop, the results are at the mercy of the "button up" mechanic.

Does he know the right places for everything? Will he check all gaskets; replace those that "have just about had it"? Only experience and the skills that grow from working up to top standards can come close to guaranteeing these things, and others, such as that machine screws, bolts, nuts will be drawn up properly and to specified torque values.

Use of instruments like the cylinder gauge, to determine taper in ring and piston work, is a typical sign of craftsmanship.



Practiced skill in precise measurement is part of craftsmanship. Here, the inside mike gives the required information.

Mature judgment tells the craftsman how tight to draw up threaded parts if torque isn't specified; and leads to correct decisions on other key questions.

POWER TRAIN SERVICING

All the requirements of top standards also apply in jobs on the transmission, drive line and rear axle. Diagnosis must be accurate; corrective work has to be done precisely and exactly according to established procedures. While the manual transmission, as a case in point, doesn't have the servos, pumps and other units of the automatics, it will operate properly only when the parts are in the right position and in good condition. It is treated with respect by any capable mechanic, because nothing short of perfect functioning can be considered a satisfactory result.

When it comes to automatic transmissions, the best in craftsmanship is required, as well as a great deal of highly specialized knowledge. The many inter-related elements of the complex mechanism must be assembled correctly, put in top condition and perfectly synchronized. Any adjustments must be made right to specifications. It goes without saying that the many fluid passages and close-fitting parts are practically a guarantee of real operating trouble if grit, lint, dirt or any other foreign matter is permitted to get in.

One of the hardest working assemblies of the automobile, the rear axle, too, is a trap for the untrained or otherwise unskilled—not to mention the careless mechanic. It accepts the energy output from the engine, changes its direction and applies it to the drive wheels. The powerful stresss involved in this process demands that every adjustment for end play, bearing pre-load and engagement of ring gear and pinion, be exactly right. Technical information must be obtained and intelligently used.

While drive line work is simpler by comparison, it's obvious from the power-transmitting role of this assembly, that it too must be handled with skill, understanding and care.

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- Parts that reduce your installation time
- Excellent profit opportunity

YOUR CUSTOMERS GET:

- Exact duplicates of original Chrysler-engineered equipment
- Original equipment performance
- Improved performance at less cost

Be sure you have adequate stocks to take care of your Safety-Check Customers promptly. Call your MoPar Wholesaler. He'll see you have the *right* MoPar Parts at the *right* place at the *right* time. This means better *service* for your customers, bigger *profits* for you!

***Sell* the line that keeps your customers sold on you—MoPar**

MoPar PARTS AND ACCESSORIES
MoPar Division, Chrysler Motors Corporation
Detroit 31, Michigan

READY NOW!

MoPar's new "Replacement Parts and Service Guide." 100 pages filled with profit-making tips and timesaving information on how to repair and service 1946-1959 Chrysler Corporation vehicles. Get your free copy from your local MoPar Wholesaler today!

BRAKES

Good brakes don't just happen, of course. But the way brake systems are often serviced, you might think they work well just by existing! Actually, a good brake job requires a certain amount of geometry, and a large amount of know-how and mechanical ability.

Considering that everyone knows what can happen to driver and passengers when automobile brakes fail, one might expect to find every mechanic especially careful and practiced in brake system work. The truth is that only the service man who is a craftsman "across the board" is really a reliable workman for these jobs.

That kind of mechanic will understand the geometry involved in the concentricity of the linings with the drums, which depend on the position of the shoes. On brakes with fixed anchors, greater precision is needed to get "good brakes." Any skilled brake mechanic understands that shoes must fit the drums along their whole length—not only at either or both ends, or in the middle of the lining.

Among the keys to craftsmanship in brake system work are thorough understanding of the operating mechanisms, including power brakes; devotion to top quality in linings and brake fluid. New drums, rather than old ones from which more than the allowable amount of metal has been removed, are the insistence of the good brake service man. There can be no compromise with quality if the system is to assure the customer of many miles of safe driving —which it should—after the work has been done.

SPECIALIST OR "GENERAL PRACTITIONER"

In day-to-day shop work, there's no difference in the need for craftsmanship between the specialty shop and any other shop. The customer expects the same top-quality work from both . . . and probably, today he's as often disappointed with one as with the other.

Craftsmanship makes the same demands of any mechanic or any shop. You might say that the man in the general shop has greater need for top standards in his work. After all, he's expected to tackle any and every kind of job that comes his way; or in other words, to be many kinds of a specialist. Most often, too, he's the man who puts the finishing touches on the car for which some of the work has been "farmed out." As a result, he has the "last word" on the quality of the job, on the customer's satisfaction, and on how the shop itself "comes out."

MENTAL ATTITUDE IMPORTANT

Whether or not a mechanic is or can become an automotive craftsman, depends on his mental attitude toward the field and his own prospects more than on any other single factor. Most persons who have normal intelligence and are in good physical condition can make the grade, if they want to and are willing to make the effort. Once the beginner has made up his mind, he can be taught the necessary skills; can be given the needed technical knowledge, and instructed in how to "keep up" with technical developments.

Shop management would do well to encourage, and stimulate the process among the mechanics. For craftsmanship is becoming more and more the difference between success and failure for the shop, as well as for the person.

For the shop, top standards in the work its crew does means more satisfied customers, larger volume of service work. To the mechanic himself, craftsmanship means going further in the field of his choice, making more money, and having the personal satisfaction of knowing that he is the master of any service situation that may come up.

There can be no compromise with craftsmanship when it comes to brake work—too much depends on reliable and effective brakes. This craftsman is taking careful measurements of the brake drums. He will remove no more than the permissible amount of metal from the inside of the drums; will insist on new drums if needed.

Servicing Sweepstakes Offers Cool Incentives

From the beginning of June through November 30, the men who work in car dealer and independent service shops may show more than usual fondness for rabbit's feet, four-leaf clovers and horseshoes. It would be understandable, for any service man with a solid assist from Lady Luck could find himself with an Esther Williams Living Swimming Pool in his back yard.

It would get there compliments of the Purolator Products' "Prizarama Sweepstakes," which will run six months, in three two-month segments. There will be awards for the periods ending July 31, September 30, November 30. The pools are Grand Prizes: fully-installed, 16x20 feet, with filtration system, underwater lights, vacuum cleaner, life rings and kickboard.

NOT A CONTEST

No contest on any type, Prizarama will reward fortunate service men on the basis of drawings from among entries. To become eligible, the service man mounts a Purolator "Seal of Approval" on the door jamb of a car or truck; peels off the back side, which is the entry form.

It is filled in with the service man's name and address, the license number and state of registration of the vehicle; and mailed to Prizarama headquarters for inclusion in the drawing.

Although there's no objection to the car owner buying a filter at that time, the service man need not sell one to qualify for Prizarama. All that is required is that he mount the seal. Nor is there any limit (except those of his own time, diligence and strength) to how many entries an individual can submit. The primary aim of the campaign is to have every car and truck "tagged."

Seals of Protection are packed in filter refill boxes, and extras can be obtained from the shop's regular supplier. The campaign will be backed by network radio promotion of the Seal.

THREE CHANCES TO WIN

In all, prizes valued at more than $126,000 will be distributed through Prizarama. Its first two drawings will be from among entry forms submitted in the preceding two-month period. The third will be a "Blockbuster" from all entries, giving another opportunity to those who didn't win the first two times around.

In addition to the pools, these are among the 2,400 prizes: Triumph Estate station wagons, compressors, auto air conditioners, tool kits, battery testers, jacks, outboard motors; such leisure living gear as golf clubs, luggage, fishing sets, riding lawnmowers.

Import Cars Can Use Many U.S. Replacement Parts

Don't make the mistake of snubbing the owner of an import car, advises R. F. ZurLinden of Zurlinden Sports Car Service, Canton, Ohio. Many shops do, in the belief they can't get needed parts; whereas many American made parts fit the imports and are readily available, he points out.

Most of the imports have electric pumps, which can be replaced by domestic makes, especially on English cars. Outside diameter of the copper tubing is the same as that on U.S. cars; standard fittings can be used, according to ZurLinden.

Fan belts are another simple case of replacement, with a full line specially made for the imports by domestic manufacturers. Beyond that, a Ford-6 belt will fit the Hillman; a Pontiac, the Jaguar; '36 Chevvy, and MG.

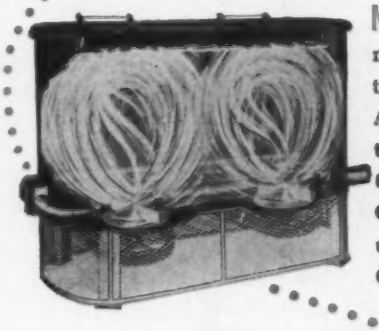
Many American-made hose, too, will fit the little "bugs" from abroad . . . and all domestic hose clamps will fit all import makes. There's at least one fuel filter made in this country that can be used on any of the imports. ZurLinden says. It doesn't require metric of Whitworth fittings; is installed by simply cutting the gas line and using the hose and clamps furnished.

Say You Saw It In
Automotive Service Digest

"Still Taking the Country 'BUY' Storm!"

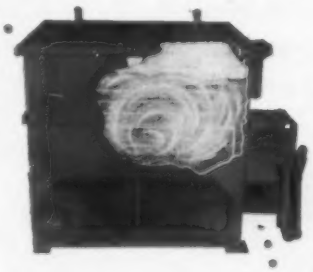
TURBO-BLAST

World's Fastest Cleaning Machines



Model 236 is equipped with two 5-HP motors turning impellers, creating tremendous agitation of the detergent. A scrubbing action is thus attained to clean FASTER, MORE THOROUGHLY, and MORE ECONOMICALLY! With 300 gallon capacity this unit answers the Engine Rebuilder's Cleaning Problem!

Model 122 has a 115 gallon capacity. The ideal size for the average Automotive Machine Shop. Powered with one 3-HP motor. ALL TURBO-BLAST CLEANING MACHINES HAVE SUPER AGITATION! ...with CONTROLLED FLOW PATTERN! All models can be equipped for gas, oil, steam, or electricity.



There is a Turbo-Blast Model for Every Cleaning Job!

Write for Free Literature on all S-V Equipment . . .

Storm-Vulcan, Inc.

MANUFACTURERS OF AUTOMOTIVE ENGINE REBUILDING EQUIPMENT
2225 Burbank Street • FLeetwood 1-3735 • Dallas 35, Texas

Rochester's Model 4GC . (*Continued from page 37*)

tions the automatic choke assumes a position where the torque of the thermostatic coil is balanced against vacuum pull on the choke piston, plus the velocity of the air against the offset choke valve. As the heat from the exhaust manifold relaxes the tension on the thermostatic coil, the choke valve gradually opens.

When the engine is started cold and the throttle is opened considerably, as would be the case when going up a steep hill, vacuum drawing heat to the thermostatic coil housing may not be sufficient to heat and relax the coil before loading up takes place. The choke modifier, being linked directly to the throttle by means of the throttle shaft modified lever, choke modifier rod, thermostat modifier lever and index plate, is actuated by the slightest throttle movement. Thus the choke modifier lever rotates the thermostatic coil, thereby relaxing the tension on the coil and allowing the choke valve to open sufficiently to prevent "loading up."

CHANGES FOR 1959

The carburetor used on the General Motors Corp. cars is substantially as described here. However, there are a few relatively minor changes adopted for some of the cars or some models.

For example, Buick uses four corner pitot tubes to replace the two pitot tubes used in previous models. Hex head idle mixture screws are used to allow easier adjustment. The float system incorporates the vacuum assist primary float.

The idle compensator is used to prevent stalling during prolonged hot idle conditions. It is mounted between the main venturis on the secondary side, and consists of an air valve, a bi-metal strip, a holder and mounting bracket. Its purpose is to admit additional air for idle under hot idle conditions to prevent stalling. A passage is drilled from under the valve seat, through the bowl casting, into the throttle body and below the primary throttle valves. When the temperature of the air in the carburetor becomes too hot for good idle quality, the bi-metal strip is heated sufficiently to cause the strip to bend. This overcomes the effects of manifold vacuum on the valve and the valve is forced open. Once open, air is drawn into the carburetor bores below the throttle valves and is mixed with the regular fuel-air mixture. The enriching effect of the hot idle are thus offset and stalling from this cause is practically eliminated.

On Cadillac, the choke modifier has been eliminated. Better heat to the choke housing made possible the removal of the modifier. The vacuum assist float and the idle compensator are used. Secondary discharge holes and secondary auxiliary throttle have been added.

On Chevrolet's 348 cu.in. engine, a secondary idle system has been added to provide secondary discharge holes located in the secondary bores above the throttle valves. The secondary idle discharge holes are not exposed to manifold vacuum until the secondary throttle valves start to open. These holes feed fuel into the secondary bores between the time the secondary throttle valves start to open and the time the auxiliary valves open. Smoother driving in this interval is thus obtained. On air conditioned cars, the 4GC will be equipped with an Idle Compensator.

On Oldsmobile, a fast-acting choke design places the fast idle cam on the choke housing side of the carburetor instead of on the throttle lever side. The vacuum assist float is used, and a secondary idle system has been incorporated. There is no choke modifier on the 1959 model.

FAST ACTING CHOKE

The most important change is the fast acting choke. This feature allows the fast idle to be regulated separately from the choke valve. Movement of the fast idle cam is now directly related to the movement of the choke coil instead of allowing it to follow the action of the choke valve as in previous designs. When restarting a partially warm engine, the choke valve will assume a position independent of the positioning of the fast idle cam because of the over-riding function of the slots. The idle compensator is incorporated in air conditioned models.

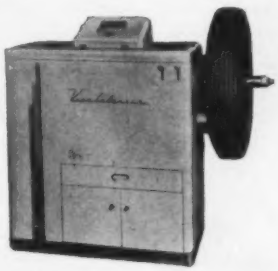
GRIND
CRANKSHAFTS
✓ IN THE BLOCK
✓ IN THE LATHE
✓ IN THE STAND
The Winona Crankshaft Grinder has been giving fast, accurate service for over 20 years. It will grind crankpins from 1" to 3½" in diameter in the block! Or, with the crankshaft in your lathe it will grind crankpins and main bearings. A Grinding Stand may be used instead of a lathe. It enables you to control your price, profit and delivery. Write today for prices and literature.
WINONA TOOL MFG. CO.
WINONA, MINN. U.S.A.

WHEEL BALANCING NEWS

Wide Choice of Balancers Lets You Fit Your Business Exactly

First step toward wheel balancing profits is the right choice of equipment. And John Bean makes the right choice easy. Whether you're beginning, expanding, or replacing, you can fill all your needs from this single line. Small economy balancers, on-the-car models for fast checks, a special balancer for truck service, deluxe beam-of-light balancing . . . all are included. Whatever your needs, whatever your means, there's a John Bean balancer that's made just for you. Discuss your plans with a John Bean representative, whose advice is backed by the most complete line of balancing equipment.

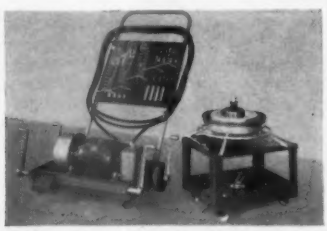
Impossible Jobs Made Easy With Visubalancer



No other balancer in the world combines the optical precision of controlled light beams with fast easy operation like the Visubalancer. Accuracy is so perfect that as few as two weights can be used to correct both static and dynamic balance. While the wheel spins at high speed, viewing screen tells exactly how much weight is needed and where to put it. By eliminating human error, Visubalancer makes 'impossible' jobs easy, and makes an expert out of any operator. (Bulletin No. L-1639)

Add Extra Profits From On-The-Truck Balancing

Truck wheel balancing can add the extra profits that will make your business really pay. For speed and ease of operation, the John Bean On-The-Truck Balancer is unmatched. Positive J-bolt mounting requires no disc adapters. No wheel parts need be removed. Portable spinner handles heaviest wheels. (Bulletin No. L-1086)



New On-The-Car Balancers Combine Speed and Accuracy

This new, John Bean balancer combines truly accurate balancing with fast, simple operation. New design permits more positive installation and precise centering. Fits 12" to 16" wheels without adapters of any kind. No need to remove bolts, studs, etc. Entire wheel assembly is balanced as an integral unit. John Bean's unique vibration indicator shows customer the effects of wheel unbalance at any speed . . . and shows him the advantage of correct balance when you're finished. A complete wheel balancing department is yours with any of these three units. Model 1023 is equipped with a single motor wheel spinner and operates on 110 volts, while Model 1024 shown above has a twin motor spinner and runs on 220 volts. Pictured also is the John Bean economy balancer complete with Jiffy Stool, and short-handled spinner. (Bulletin No. L-1648)

Pinpoint Precision on an Economy Budget

For fast accurate balancing with minimum investment, choose this John Bean 55J Wheel Balancer. Guesswork is eliminated completely because accurate gauges tell how much weight to use and where to use it. Shown in position for dynamic balancing, the hinged wheel and spinner assembly is tipped to a vertical position for static balancing.
(Bulletin No. L-1638)

The new John Bean Acra-Speed balancer is fast and precise, permits balancing a wheel in as little as 2 minutes! No adjustments to make, no complicated procedures. Balance the wheels on just 20 cars, and Acra-Speed has paid for itself! (Bulletin No. L-1644)

FOR MORE INFORMATION Write today for Bulletins as noted above

JOHN BEAN, Lansing 4, Michigan
Division of Food Machinery and Chemical Corporation

fmc

Servicing the Simca

General knowledge of the design, observance of necessary clearances, tolerances and torquing specifications opens the door for custom or general maintenance applicable to this small import motor car.

● THE SIMCA ARONDE is one of the more conservatively designed French imports. It carries its engine in the front, uses a solid rear axle housing, leaf springs in the rear, coil springs in the front with a ball-joint suspension system.

The company makes a number of styles and models of passenger cars and commercial vehicles and although all of them are not imported, there is a wide choice available in the U.S. Included are four-door sedans, station wagons, convertibles, and hardtops. This line is powered by a water-cooled four-cylinder engine. (There is also the Simca Vedette, which has a V-8 engine, and the Montlhery model with a higher-compression version of the 4-cylinder plant.)

The Chrysler Corp. has taken over the distribution of Simca in the U.S., so parts and service, as well as sales, will be supplied by some of their dealer outlets.

The solid unitized bodies give the 1-ton-plus Simca a solid ride that belies its small size. The 48 hp. engine with its 4-speed transmission delivers power in the needed ranges to make the car a good city traffic performer as well as a capable road car.

With sales distribution through established outlets and favorable performance assuring acceptance, the Simca is certain to be a frequent visitor to service outlets in general. Consequently, shop operators and mechanics will be interested in knowing something of the service specifications and procedures recommended by the factory.

While most of the service procedures are simple because of the conventional construction of the vehicle, metric wrenches are, of course, necessary, as in the case of most imports.

The general specifications on the Simca Aronde run as follows:

Horsepower	**48 @ 4500 r.p.m.**
Max. torque	**65 lbs/ft @ 2800 r.p.m.**
Compression ratio	**7.8:1**
Cylinders	**Four**
Bore and Stroke	**2.91" x 2.95"**
Displacement	**77.4 cu.in.**
Carburetor	**Solex, downdraft type**
Voltage	**12 volts**
Valves	**Overhead**
Weight	**2050 lbs; height 56.9", width 61.3"**
Forward gears	**Four**
Axle ratio	**4.44:1**
Length	**162"; turning circle 36'**
Wheelbase	**96.2"**
Tread	**Front 49.4"; Rear 49.2"**
Tire size	**5.60 x 14**
Fuel capacity	**10 gals (approx.)**
Suspension	**Front: coil springs and telescopic shocks**
	Rear: leaf springs and telescopic shocks

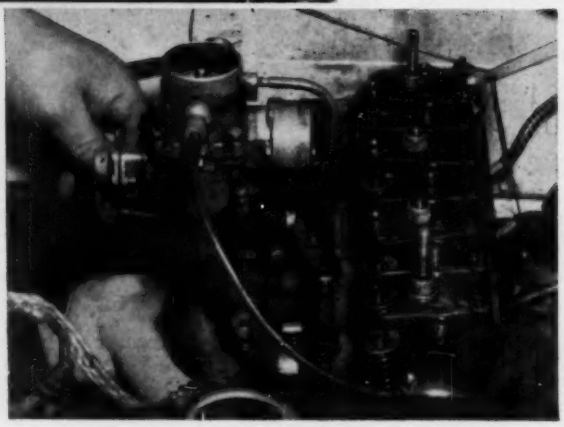
Caster 1½°, Camber 1½°, Toe-in ⅛"

The aluminum cylinder head should never be removed from the block when hot. When head has been replaced on block the nuts and bolts are preliminarily tightened to 13.4 ft. lbs.

To avoid warping the aluminum head, bolts and nuts must be accurately torqued in the proper sequence.

Part VIII of a feature series

By E. S. HARRIS
Field Editor



Final idle adjustment is made with engine running between 500-600 r.p.m.

with a torque wrench. The final tightening to 43.4 ft. lbs. is made when the engine is cold after having been run at its normal temperature, and allowed to cool. Always tighten in the specified sequence to avoid distorting the head.

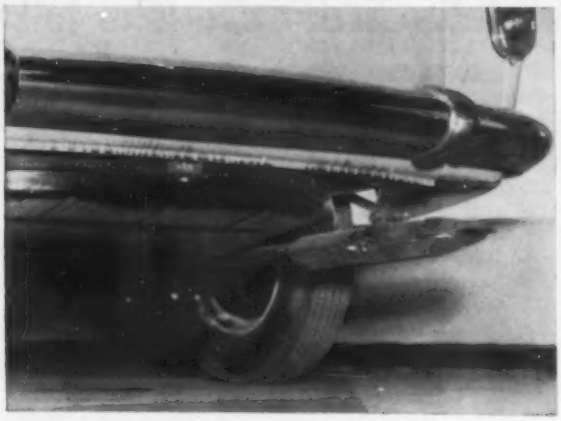
The self-locking nuts securing the rocker shaft brackets should be removed only after engine is cold. On a hot engine the nylon retainer may bind and cause damage to the threads.

Timing marks may prove confusing unless the source of the abbreviation is understood: PMH = TDC and PMB = BDC. "Admission" is the word for Intake and "Echappement" for Exhaust. The calibration on the oil dipstick may be in liters instead of quarts so add oil accordingly.

Valve adjustment clearances are made in the following sequence when the head has been removed and then replaced: Run engine until normalized and adjust intake clearance to .0059" and exhaust to .0098". Allow engine to cool and tighten head bolts to 43.4 ft. lbs. in proper sequence when cold. After head is tightened readjust rockers to .0039" (inlets) and .0059" (exhausts).

The fan belt tension is adjusted by moving the generator; fan can be turned but against considerable resistance when adjustment is correct.

A centrifugal advance plate controls the distributor advance, two weights and springs acting on the cam control the advance in proportion to the engine speed. The advance is diminished from 6° onward when one of the weights meets a stop. Breaker arm spring tension should not be less than 19 ozs., breaker gap is .017", breaker timing 4° before TDC, automatic advance 44° crankshaft, total advance 48°. (Simca Sport engines 0° or TDC, automatic advance 44°.) Distributor rotation is clockwise. Condenser capacity is .28 mfd. Spark plug gap is adjusted to .020". Firing order 1-3-4-2.



Rear muffler may be replaced separately by cutting tail pipe and using coupling sleeve to join old tail pipe with new muffler.

CARBURETION

The Solex carburetor has an automatic choke (autostarter) operated by a bi-metal coil. When the engine is cold the plate is held in the "choke" position by the elasticity of the coil. As the engine is started, air drawn through a "U" tube is heated by exhaust gases; the rising temperature in the housing causes the coil to dilate, driving the shutter plate clockwise. When the plate has cleared the "choke" position a spring latch riveted to the cover plate wedges into the slot in the pivot and prevents it from rotating backward unless the temperature in the housing has lowered considerably.

The base plate has a scale on top and the housing an index. The index should be located opposite the punch mark on the scale. When disassembling the automatic choke do not remove the cotter pin in the shutter plate pivot. The bi-metal coil never requires disassembly since the whole assembly must be replaced when the coil is faulty. Also, there is the possibility that the shutter plate may be oriented incorrectly at assembly or the bi-metal coil with the wrong side up.

The accelerating pump of the diaphragm type, on the carburetor is located in a housing located on the outside of the carburetor body. The injection rate is governed by the size of the jet. The screen at the ball seat should be cleaned every 1,800 miles. Idle adjustment should be made at 500-600 r.p.m. (about 9½ m.p.h.).

The cooling system is conventional, with the thermostat located in the cylinder head water outlet. To test the thermostat, place it in a container of water on a hot plate. The valve should start opening at 78° C and should open by 6 millimeters at 88° C. When plunged into water at 90° C it should open completely in less than 5 seconds.

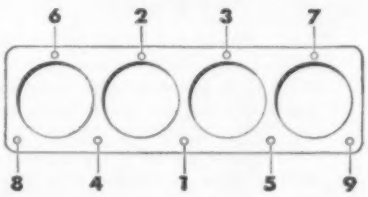
The water pump, mounted on two ball bearings, is held to the cylinder block with 6 screws, and is driven by the fan belt.

The plastic used as fuel lines is easier worked and shaped if warmed in water.

TORQUE CHART

Cylinder head: First tightening—run up nuts or bolts cold.
Second tightening—Tighten to 43.4 ft./lbs. cold.
Third tightening—re-tighten to 43.4 ft./lbs. cold after a warming up.

	ft./lbs.
Nut or screw, main bearing cap	32.5
Main bearing cap stud	32.5
Connecting rod nut	18.1
Cylinder head stud	43.4
Flywheel to crankshaft flange screw	18.1—21.7
Oil pan screw	7.2
Rocker shaft bracket nut	21.7
Intake manifold nut	18.1
Engine mount bracket screw	21.7
Fan securing nut	25.3
Engine mount rubber insulator nut	81.0
Camshaft nut	28.9
Clutch pressure plate studs (earlier type)	18.1
Rocker adjusting screw	7.2



Recommended sequence to follow when torquing cylinder heads.

VALVE TIMING

Setting with theoretical clearance .01" on cams and .0145" between valves and rockers:

Intake valve opens before TDC..12° @ .0394" from TDC
Intake valve closes after BDC..60° @ 2.378" from TDC
Exhaust valve opens before BDC.52° @ 2.551" from TDC
Exhaust valve closes after TDC.20° @ .114" from TDC

Clearance between rockers and valves cold:
Intake .0039"—Exhaust .0059"

Safety-Check drive is in full swing

• AGAIN THIS YEAR, May is the month of the safety theme, as the annual National Vehicle Safety-Check campaign is conducted in the 34 states that do not require periodic car inspection by law. Under sponsorship of the Inter-Highway Safety Committee and LOOK Magazine, and in cooperation with the Association of State and Provincial Safety coordinates, civic, business and safety organizations are focusing public attention on the benefits of safe operating condition and the perils of neglect.

Independent service shops, car and truck dealers and other segments of the automotive service industry join with organized community safety-lane activities — or conduct private programs where there is no official campaign—to give motorists an opportunity for a free, thorough inspection. The 10-point check covers brakes, front lights, rear lights, steering, tires, exhaust system, glass, windshield wipers, rear view mirror and horn.

In last year's Safety-Check, covering three million vehicles in 2,000 communities, one out of every five vehicles was found to need immediate service to correct unsafe conditions. Some states reporting on official inspections have rejected as high as 50 per cent of all vehicles inspected, because of need for service.

As a result, automotive service establishments in many localities saw business boom during and immediately after the Safety-Check campaign. Many motorists have the necessary work done at once, in order to take the cars back to the check lane and obtain the official approval of condition.

Managing Director M. R. Darlington,

ELECTRIC and AIR IMPACTOOLS

NEW

(3/8" bolt size)

(1-1/4" bolt size)

(5/8" bolt size)

ELECTRIC 5U-HD IMPACTOOL

Light, powerful and easy to operate for long periods. Built to handle all but the biggest nuts and bolts. Ideal for day in and day out garage use. Also available in TORQUE CONTROL (Size 5UT) with adjustable torsion bars that provide torque control from 20 to 90 ft. lbs.

ELECTRIC 34U IMPACTOOL

Sturdily built for the tough, dirty jobs, but small enough to use on spring U-Bolts, Budd wheels, etc. I-R's 34U is the only electric tool you can buy that will handle the biggest motor chassis and wheel jobs on the road.

ELECTRIC 8U IMPACTOOL

Slightly larger than the new 5U-HD, this is the powerful and rugged multi-purpose Impactool for breaking loose frozen and broken studs, reaming, tapping and other tough, service work.

18-933

Call your I-R Jobber today for details and prices on the most complete line of Air and Electric Impactools for automotive service.

The smartest way to reduce labor costs and build your service business overnight.

Jr., of the Inter-Highway committee urges all service shops to get behind the drive for the dual reason of public interest and good business. Public officials, business and civic leaders and outstanding organizations in the community generally take a leading part, he points out, and there's no easier or more commendable way for a service shop to earn the respect of the public than to be counted among the participants.

Defective Shoes Cause Brake Grab

Brake pulling, grabbing or uneven application on 1959 Lincolns and Continental Mark IV's may be caused by weld irregularities between the brake shoe web and lining attaching plate. A weld failure can also cause brake drag and resultant overheating and increased lining wear.

Weld imperfections can be most readily seen at the ends of the web. If this situation is found, replace the brake shoe—do not try to reweld the web.

To make your shop more profitable . . . your time more valuable . . . be sure to read this month's "These Are New" section

Anodized Aluminum Parts Require Special Cleaning

A recent Plymouth Service Bulletin states that only a mild detergent and soft brush should be used in cleaning anodized aluminum parts and trim. The use of polish, abrasive cleaners, or steel wool will remove the protective coating and may scratch and discolor the finish.

Some cases have been reported where the grille and headlamp doors have turned a milky white. In all cases reported, this condition was found to be caused by a high-alkaline substance used in steam cleaners for cleaning white side wall tires.

ONLY Ingersoll-Rand HAS ALL THE TOOLS TO HANDLE EVEN YOUR BIGGEST JOBS . . . FAST and EASY

NEW

434 AIR IMPACTOOL

This Impactool is NEW from end to end! Gives you 350% faster run down; uses 32% less air; is 25% lighter and 40% shorter. The ideal tool for heavy truck and bus jobs—makes wheel work a cinch. Be sure to try it!

(1-1/4" bolt size)

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By HERB CARRIER
Detroit Editor

Fuel control systems

Converting liquid gasoline into mechanical energy involves more than carburetion. Air filters, manifolding and exhaust systems—all play an equally important role in providing efficient, economical engine operation from tank to tailpipe under constantly changing conditions.

Part VI—The Exhaust System

• IN ONE RESPECT, an automotive gasoline engine is like an atomic reactor—they both have special problems in disposing of the deadly by-products of power-producing procedures. Radioactive waste from a reactor is highly respected as a potential killer, and elaborate care is taken to see that it is discarded where it will do no harm.

Equally as dangerous, but much less glamorous, is the carbon monoxide found in the exhaust gases of a gasoline engine. Automotive manufacturers, too, are very careful in designing efficient exhaust systems for their vehicles. When new and in good shape, a typical exhaust system will effectively escort the burned gases from the engine safely away from the vehicle.

The exhaust system of an average passenger car consists of an exhaust manifold (a single manifold is used on six-cylinder installations, and two manifolds are used on V-8 installations), exhaust pipe, muffler, and tailpipe. An automatic heat control valve (heat riser) is built into the exhaust system. The valve is usually located at the junction point of the exhaust manifold and the exhaust pipe.

The exhaust manifold is generally constructed of cast iron. The remainder of the system, with the exception of the heat riser assembly, is rolled or extruded steel. The heat riser body is cast iron, and the valve, spring and shaft are steel.

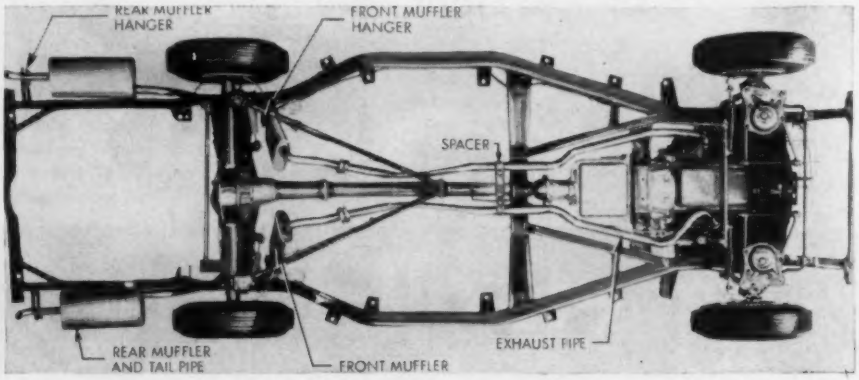
Location of the various exhaust system components such as mufflers, tailpipes, etc., vary from one make of car to another. The only determining factor is frame and chassis design. At one time, the Hudson used no tailpipe; the muffler was the last component of the exhaust system. At the other extreme, some six-cylinder engine cars have placed the mufflers almost in the engine compartment. Within reason, of course, it's incidental where the muffler is located in the exhaust system.

MUFFLER OPERATION

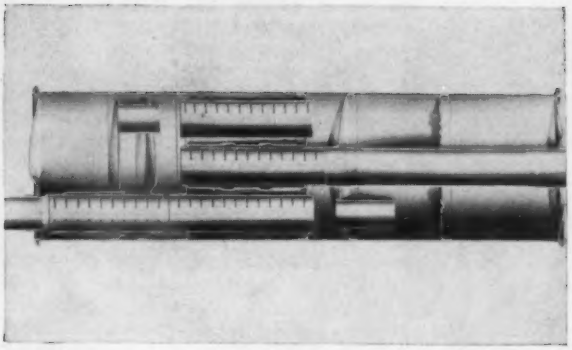
Mufflers quieten sound in two ways: expansion and cooling. Exhaust gases leaving the combustion chambers are red hot and roaring. Little is done in the exhaust manifold or the exhaust pipe to change either tone or temperature. The basic function of these units is merely to conduct the gases to the muffler for treatment. In the muffler the gases are first allowed to expand. This is one reason the muffler is larger in diameter or cross section than either the exhaust pipe or the tailpipe.

As the hot gases expand, they lose the major share of their roar. A large drum with a small inlet and outlet would make a fairly efficient muffler. Modern automotive design leaves no room for out-sized mufflers; so the large drum is considerably reduced in size. Much of the large drum effect is maintained in a modern muffler by skillful baffling and routing of the exhaust gases. In most mufflers the gases are forced to double-back at least once before being directed into the tailpipe.

Delaying the rush of the gases in the muffler also



Typical exhaust system installation for a V-8 engine consists of dual exhaust pipe, front mufflers, rear mufflers and tail pipes. Generally, rear muffler is termed a "resonator."



As exhaust gases enter the muffler, they expand rapidly—which helps quiet the roar. They are then back tracked through, allowing heat to dissipate and further reducing exhaust noise.

serves to cool them. Cooling takes place because the muffler's outer surfaces are exposed to the stream of air passing under the vehicle. The exhaust pipe and the tailpipe are exposed to the same airstream, but the cooling surfaces of the muffler are much greater than either pipe. The combination cooling and expanding treatment is sufficient to lessen adequately the roar of the engine's exhaust. The "whisper quiet" touch is delivered by the final cooling the gases receive in the tailpipe.

MUFFLER LIFE LIMITED

New materials and coatings recently developed have substantially increased the life expectancy of standard equipment mufflers. Starting with the 1959 models, major manufacturers have equipped their cars with more durable mufflers. There are many engineers who claim that mufflers should not last too long. In fact, these men state firmly that mufflers should be replaced every 25,000 miles whether they show visible signs of deterioration or not.

Their viewpoint is supported by logic: Mufflers are chronic carbon hoarders. After 25,000 miles most of them are thoroughly coked up. A clogged muffler seriously reduces engine power and performance by restricting the exit of the exhaust gases. A poorly designed muffler, or a carbon-clogged muffler are said to contribute "back pressure," a term just about self-explanatory. Rather than permitting the exhaust gases to flow freely out the tailpipe, a defective muffler retards the flow to where the exhaust gases are actually pressurized.

Modern engines with the short stroke design that makes them "square" or even "over-square" are almost bound to have high valve overlap. This means that the exhaust valve is open for quite a few degrees of crankshaft travel while the piston is going down of the intake stroke. During the overlap period both intake and exhaust valves are open. Naturally, if the exhaust system is pressurized, the incoming fuel-air mixture will be seriously diluted with exhaust gases before the compression stroke even begins. Any back pressure is undesirable; excessive back pressure can be costly and damaging. That's why some engineers recommend the 25,000 mile replacement. It makes sense, but try to convince customers to throw away a sound looking muffler and you have a lot of talking to do.

SPECIAL MUFFLERS

Many special mufflers have been developed in an effort to reduce the back pressure or to give a better tone. Relieving back pressure is understandable, but better tone can mean anything from a mellow rumble to sharp barking during deceleration. In one case, the baffles may have been removed from a stock muffler to give the degree of rumble wanted. In the other case, a custom muffler was probably installed to satisfy the rodder who "likes to hear 'em snort when I back off." Custom mufflers may be stuffed with steel wool or fiberglass to give the desired tone.

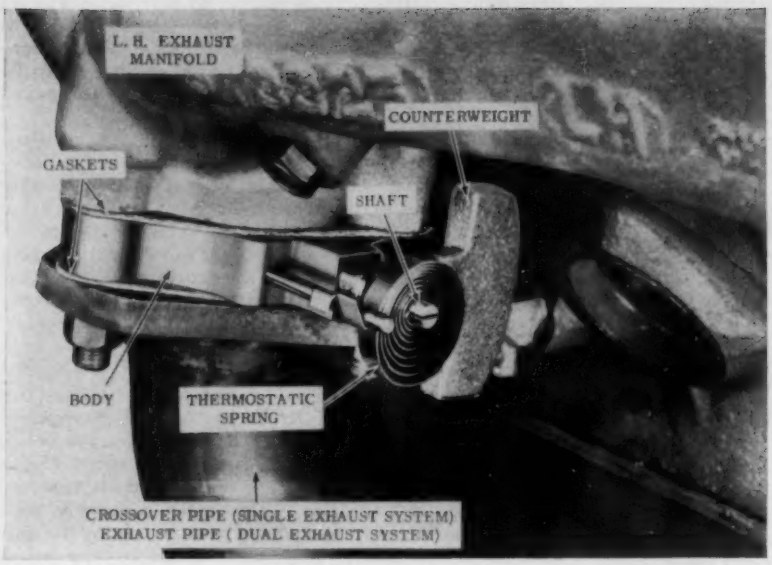
Manufacturers got into the special muffler field when they installed resonators as standard equipment. A resonator is literally a second muffler, hooked up in series with a standard muffler. Mufflers used with resonators are standard for that type of use, but if they are used without resonators they will roar much more than the truly stock muffler. With resonators, the problem of back pressure is materially reduced, and the tone improved only to the most sensitive ear.

CAUSES OF MUFFLER FAILURE

We have already determined that muffler failure can be caused by severe accumulation of carbon deposits. Another major cause is corrosion. Sulphur is present in greater or lesser amounts in almost all gasolines. It's apparent that some of the sulphur will find its way into the muffler. Sulphur and water make sulphuric acid. Water in mufflers is unavoidable because water, too, is a product of combustion. It's only a matter of time before the sulphuric acid eats through the muffler, and most all mufflers rust from the inside out.

A small drain hole is used in many mufflers to drain off the moisture formed during combustion and also the moisture formed from condensation. This drain hole is generally neglected, and soon plugs up. Muffler drain

Mufflers must be suspended from the vehicle frame by means of a flexible hanger, which is usually made of fabric. If the muffler were bolted direct to the frame, it would be subjected to severe twisting strains. Another advantage of flexible hangers is elimination of muffler drone throughout the automobile.



In order to preheat the intake manifold and improve the vaporization of the fuel, a heat riser assembly is usually built into the exhaust manifold. Its operation is controlled automatically by a counterweight and a thermostatic spring.

holes can be placed in the same category as rocker panel drain holes. Neither are generally kept open, and both could delay costly rusting.

Vibration also causes many mufflers to fail in service. The complete exhaust system from the exhaust pipe to the tailpipe is suspended from the vehicle frame by fabric straps or hangers. It's necessary to hang the system because the engine is on rubber mounts. During power surges, etc., the engine literally rocks on its mounts. If the exhaust piping were rigidly fixed to the frame, serious distortion would occur resulting in leaks. Suspending the piping overcomes this possibility.

An additional reason for suspending the piping is to eliminate drone. If any section of the exhaust piping touches the vehicle frame, a disagreeable hum or drone can be heard in the passenger compartment. The frame and body tend to telegraph and magnify the sound of the engine and the gases through the exhaust system.

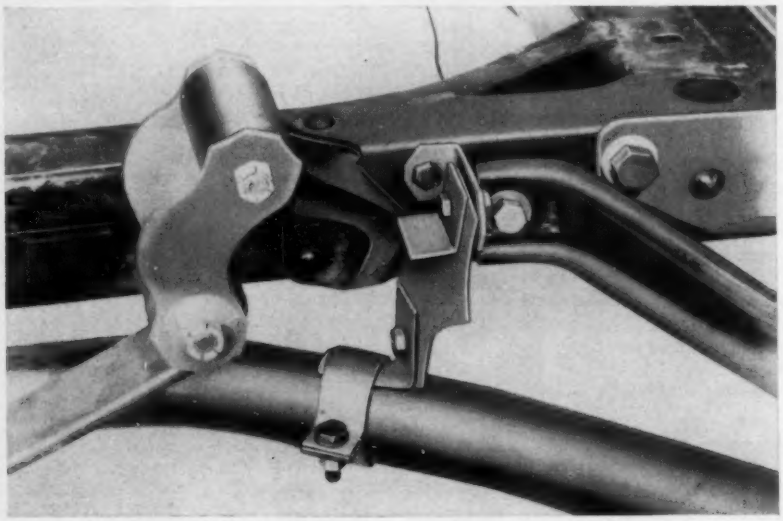
The fabric hangers last only for a limited time. Constant flexing, and exposure to all kinds of weather eventually cracks the fabric. A single broken hanger allows the exhaust piping to kink and bend as the vehicle negotiates the road surface. This unusual bending and kinking causes cracks in the pipes and rapid failure.

HEAT RISERS

The only moving part of the entire exhaust system is the heat riser assembly. It consists of a coiled thermostatic spring, a counterweight, a shaft, and a valve. In appearance it can be compared to the damper on an old fashioned stove. The counterweight and the coiled spring serve to make the damper automatic.

In operation, the valve closes to deflect exhaust gases around the intake manifold when the engine is cold or when it is idling. When the engine reaches normal operating temperature, the coil spring and the counterweight rotate the valve shaft to open the valve. With the valve open, the engine's exhaust gases are free to flow out the muffler and tailpipe without being routed around the intake manifold.

Preheating the manifold is necessary to insure adequate fuel vaporization, especially when the incoming air



Like mufflers, tailpipes must be suspended from the vehicle frame. Besides providing a flexible, silencing connection, rear hanger doubles as aligning bracket.

is cold or chilly. Preheating the intake manifold with exhaust gases is an almost universal design feature of all American built cars. A properly functioning heat riser increases gas mileage, reduces crankcase oil dilution, reduces sludge formation, prolongs engine life, etc. An inoperative heat riser has just the opposite effect, causing poor gas mileage, oil dilution, excess sludge, excess carbon, stalling, poor warm-up, etc.

As important as a heat riser is, it is seldom kept operating properly over extended mileage. The most chronic reason for the heat riser becoming inoperative is due to its working environment... directly in the flow of the red hot exhaust gases. It's virtually impossible to keep any form of lubrication on the valve shaft, so that it will turn freely on its bearing surfaces. Lack of lubrication is only one part of the problem. Lead oxide is present in the exhaust gases of a gasoline internal combustion engine. This oxide tends to pile up on the heat riser shaft and actually weld the shaft to its housing. With no lubrication and with large accumulations of lead oxide, it's no wonder that the heat riser valve becomes stuck in one position.

MAINTENANCE

Fortunately, commercial solvents are available which dissolve the lead oxide deposits and free-up the heat riser shaft. The severe working conditions under which the heat riser must operate make regular applications of a specially-prepared solvent a "must." Chrysler Corporation recommends that its heat control valve solvent be applied to the heat riser shaft every 1,000 miles of vehicle operation. Only through regular, periodic service can a heat riser be kept effectively operative.

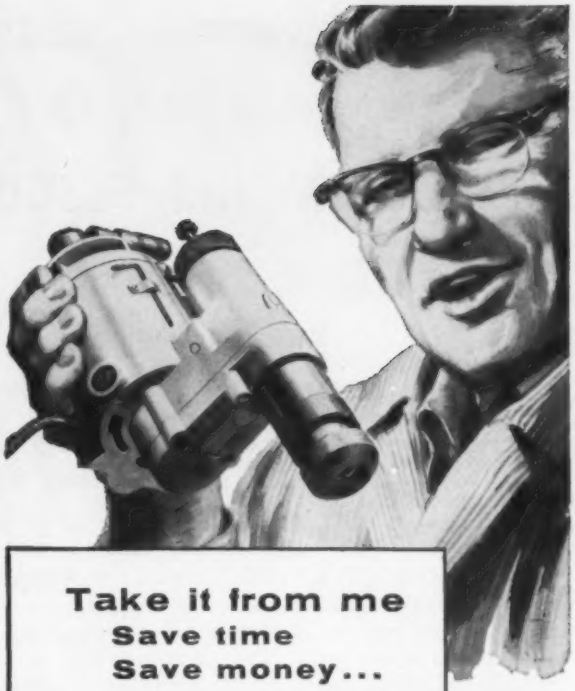
During every lubrication, the complete exhaust system should be checked carefully for leaks, cracks, or signs of deterioration. A leaking exhaust system is extremely dangerous and should be corrected at once.

Luckily, the majority of car owners are thoughtful of their own safety and the safety of their passengers. When shown a defective, or even questionable exhaust system component, they will usually authorize immediate repairs. Certainly, all mechanics should impress their customers with the importance of maintaining a sound exhaust system; and always recommend on-the-spot repairs. If all mechanics gave carbon monoxide the respect it merits, even the most adventuresome car owners would not take a chance on driving around in a potential gas chamber.

Torquing is important during the installation of exhaust manifolds. The extremes of heat to which the manifolds are subjected naturally lead to appreciable metallic expansion. If the manifolds are improperly tightened, the unequal expansion can easily cause warpage and/or cracking. For this reason alone, exhaust manifolds should always be tightened to manufacturers specifications, using a dependable torque wrench.

It's common practice to use brass nuts and steel washers to attach exhaust manifolds to cylinder blocks. The extreme temperatures of the manifolds can cause welding of steel nuts to the steel studs. Brass nuts stand up much better and aren't affected so much by the heat. A wise mechanic uses new brass nuts every time he replaces an exhaust manifold.

Another trick used by mechanics is to coat the exhaust manifold gaskets with lubricating grease before installing them. A well greased gasket, properly installed and torqued down will never leak. Old timers claim such a gasket will never blow either. Maybe this is being a little over enthusiastic, but greasing the exhaust manifold gaskets is accepted as good technique among those who learned the hard way.



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Servicing suspension systems

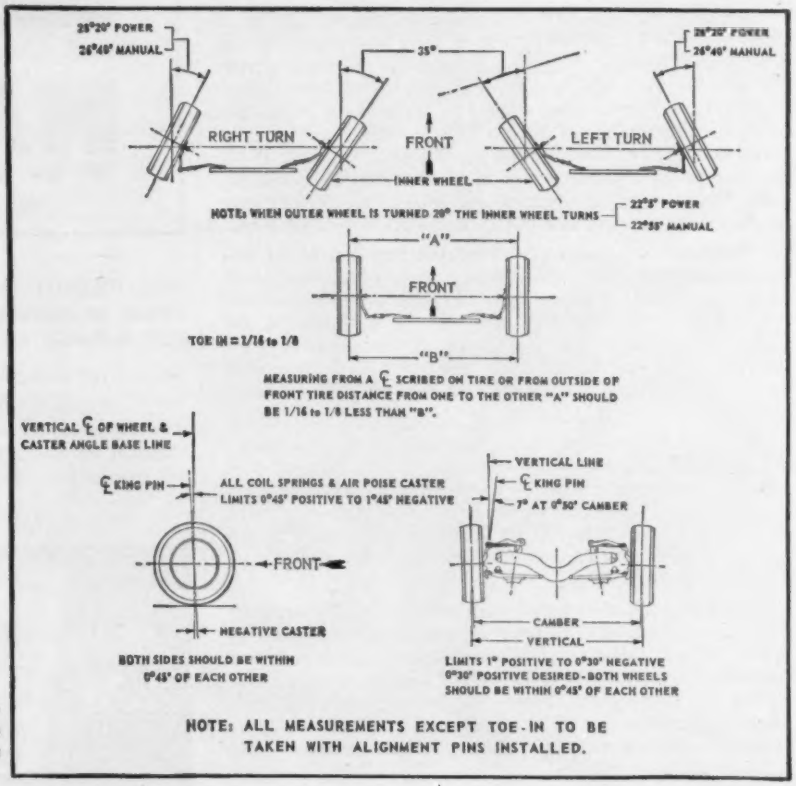
Wheel balancing, front-end alignment and front-end overhaul, make up a major area of profitable work. But to cash in properly . . . with benefit to both shop and customer . . . takes know-how, craftsmanship and proper equipment. Here are the basics for doing the job right, and very likely, far more often.

Part IV— Front End Alignment

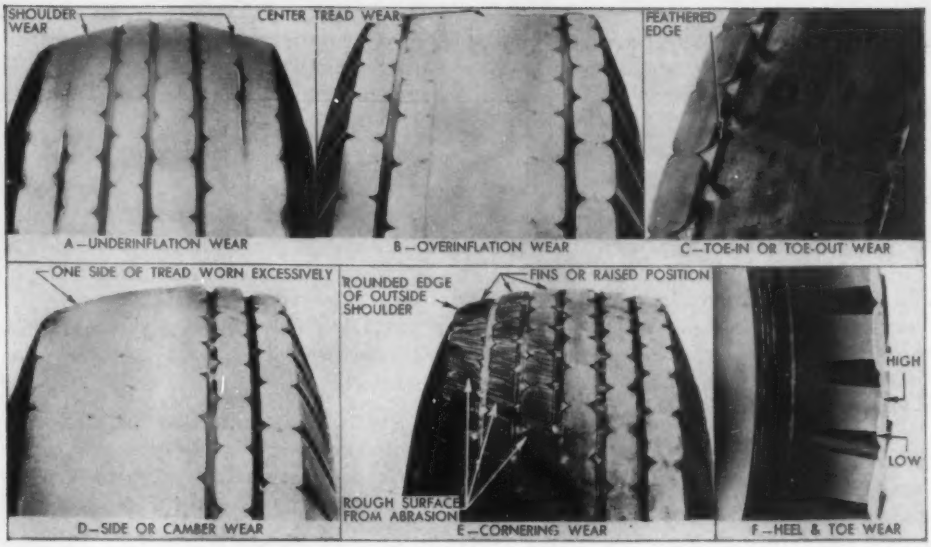
BY HERB CARRIER
Detroit Editor

• AN AUTOMOTIVE VEHICLE with a well-functioning front end system is like a big, happy family—all the related parts work together in complete harmony. Even as successful family relations rest upon individual understanding and adjustment for the most workable results, so does front end efficiency depend on unit understanding and an over-all workable adjustment.

To elaborate our analogy, Aunt Harriet may flip her lid at being asked to eat sauerkraut for breakfast because her corns hurt on rainy days, and it so happened that Mother decided to have sauerkraut for breakfast on a rainy morning. A little understanding of Aunt Harriet's problems and suitable adjustments could avert this situation. Likewise, a driver may experience erratic steering because a rear spring center bolt is sheared. The two examples don't seem to be connected, but the successful solutions to both depend upon an insight of the problems beyond the immediate results.


25°20' POWER
25°40' MANUAL
35°
25°20' POWER
25°40' MANUAL
RIGHT TURN
FRONT
LEFT TURN
INNER WHEEL
NOTE: WHEN OUTER WHEEL IS TURNED 20° THE INNER WHEEL TURNS
22°5' POWER
22°25' MANUAL
"A"
FRONT
TOE IN = 1/16 to 1/8
"B"
MEASURING FROM A ℄ SCRIBED ON TIRE OR FROM OUTSIDE OF FRONT TIRE DISTANCE FROM ONE TO THE OTHER "A" SHOULD BE 1/16 to 1/8 LESS THAN "B".
VERTICAL ℄ OF WHEEL & CASTER ANGLE BASE LINE
℄ KING PIN
ALL COIL SPRINGS & AIR POISE CASTER LIMITS 0°45' POSITIVE TO 1°45' NEGATIVE
FRONT
NEGATIVE CASTER
BOTH SIDES SHOULD BE WITHIN 0°45' OF EACH OTHER
VERTICAL LINE
℄ KING PIN
7° AT 0°50' CAMBER
CAMBER
VERTICAL
LIMITS 1° POSITIVE TO 0°30' NEGATIVE 0°30' POSITIVE DESIRED - BOTH WHEELS SHOULD BE WITHIN 0°45' OF EACH OTHER
NOTE: ALL MEASUREMENTS EXCEPT TOE-IN TO BE TAKEN WITH ALIGNMENT PINS INSTALLED.

Suggested positions of the front wheel for alignment checks and adjustments. The specifications listed apply to one specific vehicle, not to all makes and models.



Abnormal tire wear caused by front end misalignment and/or improper driving habits. Illustrations A through D are alignment problems; illustrations E and F the results of poor driving techniques.

It is important, therefore, for a mechanic to understand the reason behind the need for various front end adjustments as well as knowing the procedures for making the adjustments themselves.

REASON FOR ANGLES

1. Wheels must roll straight: Early in the days of applying wheels for rapid transportation, it was discovered that the angle at which the load was applied to the axle influenced the direction in which the front wheels rolled. Consequently, vehicle loads were applied to the front axle so that the wheels would roll in the direction of vehicle motion.

A good example of this is the ordinary bicycle. In this case, the bicycle frame is designed with a large angle between the vertical line through the center of the front wheel and a centerline through the fork of the bike. The point at which the two lines intersect is often called the **leading point.** The point of contact of the wheel, or tire, to the road is called the **trailing point.**

Now, when the bike is in forward motion, the front wheel tends to line itself up with the forward motion of the mass. Little boys often take advantage of this law of physics by peddling along at a pretty good clip and letting go of the handle bars. If their forward speed is great enough and their sense of balance reasonably good, the boys can holler to admiring little girls, "Hey look at me, no hands!"

The same engineering principle that makes heroes out of "show-off" juveniles is applied to cars that are often driven by "show-off" adults. Angles are built into the front end suspension system so that the front wheels actually exert a leading effect when the vehicle is in forward motion. Effective means are employed which enable mechanics to adjust these angles within very close limits.

The degree of accuracy, of course, depends upon the quality of the alignment equipment used, and the skill of the operator.

2. Reduce road shocks: Except in the case of power steering, there is a direct mechanical connection between the front wheels and the steering wheel. Naturally, any road shock experienced by the front wheels is transmitted—and sometimes magnified—by the steering mechanism directly to the driver's hands. A second angle is built into the front end suspension to reduce this "road shock" tendency. It is also an adjustable angle.

3. Properly position weight: Front wheels roll on bearings. For design performance, the weight of the vehicle's front end must be properly positioned on these bearings. Also, the bearings must transfer weight to the spindles at the most efficient angle. This is another very important reason for an adjustable angle being built into the front suspension system.

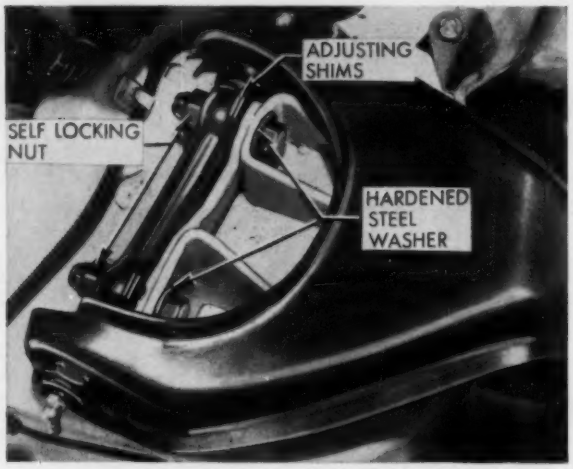
4. Compensate for "play": Even the most accurate manufacturing of front end suspension components leaves room for a certain amount of "play." The tie rod assemblies are, perhaps, the units most responsible for unavoidable front end looseness. To overcome this inherent characteristic of all standard-built passenger cars, still another adjustment is included in the suspension assembly.

Basically, these are the four reasons why modern front end suspension systems include various adjustable angles. Each of the above reasons can be expanded to include such things as directional stability, safety and longer tire life. However, these are by-products of a well-designed and well-adjusted suspension system rather than the basic reasons for the adjustable angles. True, they are mighty important, but they come about naturally when the system behaves according to designed plan.

FACTORS AFFECTING ALIGNMENT

In addition to adjustable and non-adjustable suspension system angles, there are other factors which directly influence front end alignment. These are items that may not be included in manufacturers' alignment specifications, but they must function properly before the front end suspension can be accurately checked or adjusted.

Tire Pressure: The very first thing the skilled mechanic does, before attempting to check or adjust the front end, is to make certain all tires are inflated to manufacturers' specifications. Under-inflation, over-inflation or uneven inflation between tires can throw off even the most accurate alignment job. Low tire pressure can cause hard steering and excessive tire wear. It can also intensify any tendency of the front wheels to tramp or shimmy. Tires of different makes, size or design can also adversely affect wheel alignment. The excessively high friction caused by an under-inflated tire can often cause erratic performance of the wheels and, therefore, front end alignment.



Modern ball joint suspension systems use shims placed between the upper control arms and the mounting brackets to control caster and camber. Correct adjustments are secured by adding or removing shims at either or both mounting bolts.

Wheel Run-out: All wheels have a certain amount of run-out. Determining if the front wheels run true is another vital point in the inspection before alignment. If the wheels are out of true, excessively out of balance, or not tracking properly, they must be repaired or replaced before the front end can be satisfactorily adjusted. Any permissible run-out or high spot on the tire should be marked with chalk, to aid in locating the wheels in correct position when checking or setting alignment angles. Excessive run-out will cause spotty tire wear and can prohibit proper alignment of the front suspension assembly.

The wheel and tire assembly must be as nearly concentric as possible with the steering knuckle spindle. This is important to prevent unnecessary tire wear and shimmy or tramp caused by excessive vertical movement of the wheel assembly.

Proper Balance. Each wheel assembly should be properly balanced as an essential item in the maintenance of good steering. Out-of-balance wheel assemblies—including brake drum—can cause high speed shimmy or tramp. Rear wheels, too, can cause excessive vibrations which affect the operation of the front wheel suspension system if they are excessively out of balance. Obviously, improper balance also contributes to excessive tire wear and decreased riding comfort.

Tracking: It is very important that the rear wheels track with the front ones. Wheels that do not track properly can seriously hamper proper wheel alignment and result in rapid tire failure. Improper tracking can be caused by a sprung frame, improperly installed springs, or sheared spring center bolts. Using the wrong type of spring—especially a leaf type—can also cause improper tracking. Any tendency of the wheels to improperly track must be corrected before a satisfactory wheel alignment can be obtained.

Wheel Bearings: Front wheel bearings that are incorrectly adjusted can't help but ruin any hope for correct front end alignment. If the bearings are too loose, the wheel will roll erratically, resulting in the lack of directional stability and wander. If the bearings are too tight, they can cause a binding effect and early failure. All bearings must be adjusted according to manufacturer's specifications, and properly lubricated.

Shock Absorbers: Good steering depends greatly upon good shock absorbers. Front wheel shimmy and wheel tramp very often result when shock absorbers are weak or inoperative. On some earlier model vehicles, proper adjustment of shock absorbers is an important factor in front end alignment. On late model vehicles the shock absorbers must all be within normal working range. Any weak or defective shock absorber must be replaced if efficient front wheel alignment is desired.

Steering Gear and Linkage: An improperly adjusted steering system can be the source of many steering complaints, even though the front wheels are in correct alignment. Before attempting to adjust the steering gear, all steering connections, including tie rods and drag link ends, should be checked for excessive looseness and replaced if necessary. Connections that bind in operation can be as detrimental as those that are too loose. Components causing binding should also be repaired or replaced. Steering linkage should be checked when the vehicle is on a hoist, or at least with the weight of the vehicle off the front wheels. All connections must be properly lubricated to insure ease of steer-

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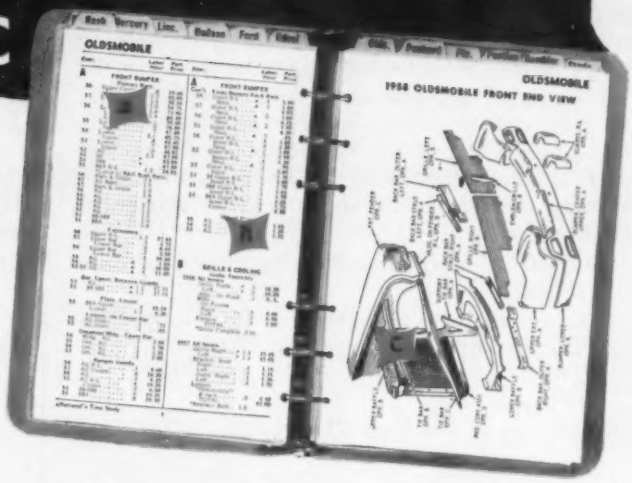

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ing and prevent excessive wear.

The steering gear should be correctly adjusted before an alignment is attempted. Excessive play in the gears will result in wandering or a general feeling of floatation.

With all the above factors checked and corrected as necessary, the wheel alignment inspection and adjustment can be accurately made. No set rule can be given for the sequence of operations in checking and correcting front wheel alignment. Nor can the exact cause of any specific misalignment be given, as a great deal depends upon the age of the vehicle and, consequently, the condition of the component parts. It is important, however, to be methodical in checking and establishing manufacturers' alignment specifications.

Ordinarily, a recommended alignment procedure is as follows:

1. Caster angle of the steering knuckle support.
2. Camber angle and kingpin inclination.
3. Toe-in of front wheels in straight-ahead position.
4. Toe-out of front wheels on turns.

CASTER

Caster is the angle of the backward inclination between the steering knuckle kingpin and the vertical plane. The caster angle is obtained by tilting the top of the steering knuckle support back, and is established by the design of the front wheel's suspension system.

Only a very slight amount of caster is required to stabilize steering. Excessive caster causes hard steering by increasing the tendency of the front wheels to toe-in. An over amount of caster is also undesirable because it can cause the weight of the vehicle to turn the wheels in at the front around their respective kingpins, resulting in wheel shimmy. The above is true of systems that use ball joints in lieu of kingpins. In this discussion the term kingpins may be considered to mean the same as ball joints.

Not enough caster can result in excessive wander, which makes it difficult for the vehicle to travel in a straight line. A car with insufficient caster tends to go from one side of the road to the other, and will turn curves easily but will be hard to straighten out when returning to a straight-ahead position.

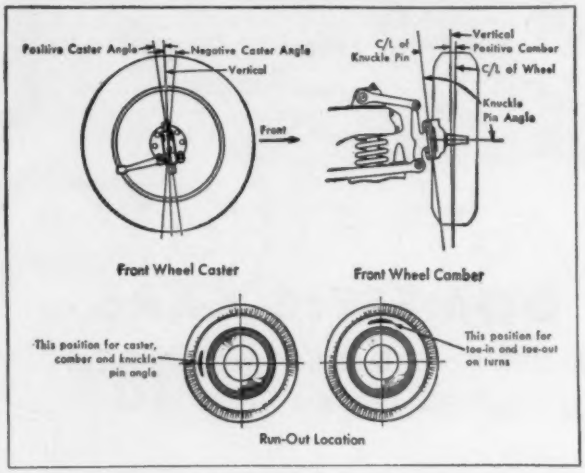
When adjusting caster angle, it is extremely important to have both wheels castered within ½ deg. of each other. Unbalanced caster can cause a pull to one side, usually toward the side with the least caster. This, in turn, can cause excessive tire wear, hard steering, and wheel shimmy.

On cars with independent front wheel suspension, caster for each wheel can be set individually. For cars using leaf type front end suspension, the caster angle is obtained through accurate mounting of the front springs. On cars using a transverse front spring, caster is usually controlled by radius rods. On leaf spring systems it is possible for the front wheel brakes to change the caster angle. This is possible because application of the brakes tends to roll the axle forward. If the spring clips are loose, this action can seriously alter caster. If the spring has permanently changed its contour, the caster angle will be wrong.

Various methods for adjusting caster include threaded bushings, tapered shims between the spring seat on the axle and the spring, and shims between the upper control arm and its mounting bracket. The latter usually applies to ball joint systems. Changing caster angle affects camber and toe-in. Therefore, it is recommended that caster be the first adjustment.

CAMBER

Camber is the outward tilt of the front wheels at the top. The immediate result is that the bottom



Caster is the forward (negative) or rearward (positive) positioning of the kingpin or ball joints. Camber is the tilting of the wheels outward at the top. Run-out location of the front wheels must be positioned as shown when making the various checks and adjustments.

of the wheels come more nearly under the load of the vehicle. The purpose of camber is to support the biggest part of the car weight on the inner front wheel bearings, to reduce side thrust, to compensate for looseness and play in steering knuckle and front wheel bearings, and finally to bring the point of pivot near the center of the tire tread.

Camber, even correctly adjusted for specific application, has one undesirable effect: It tends to cause excessive tire wear. This is because the outer edge of the tire tread rolls on a smaller circumference than the inner edge. This condition increases proportionately with an increase in camber. It also increases as tire inflation pressure decreases. Naturally, this is another reason why recommended tire pressure should be maintained.

In checking camber, the front wheels should be rotated on their bearings until the high spot of the tire is in the horizontal plane toward the front or

the rear of the vehicle. Camber angle should also be balanced so that both front wheels are within ½ deg. of each other. Unequal camber may tend to pull the vehicle to one side, usually towards the side having the greater camber.

Kingpin inclination is closely associated with camber. However, it is designed into the system and, in most every case, no provisions are made for its adjustment. If kingpin inclination is incorrect it is most likely due to a defective component which should be replaced rather than straightened or repaired.

After making corrections to the camber angle it is a good policy to rotate the tires, putting the front ones on the rear and the rear ones on the front. This will tend to overcome any uneven tire wear that resulted from improper camber.

TOE-IN

When the distance between the front of the wheels is less than the distance between the rear of the wheels, the wheels are said to have toe-in. A toe-in condition is required because camber tends to cause the wheels to run out or separate at the front. Adequate toe-in will offset this tendency, and cause the wheels to roll straight-ahead.

Excessive toe-in or toe-out results in extremely rapid tire wear. A feather edge at the inner side of the tire is caused by too much toe-in. The same condition on the outer edges of the tire tread is caused by insufficient toe-in or toe-out.

Toe-in must be checked when the front wheels are straight ahead, or with the steering gear on the high point. Also, the wheels should be rotated on their bearings so that the high spot of the wheel run out is either at the top or at the bottom.

In almost every application, toe-in is controlled by changing the length of the tie rods. Care should be taken not to disturb steering wheel center adjustment when establishing correct toe-in.

TOE-OUT ON TURNS

When the front wheels are turned right or left, they separate slightly at the front. The amount of separation increases as the amount of turn increases from the straight-ahead position. The inside wheel turns at a greater angle than the outside wheel, thus making it necessary to have the front suspension toe-out on turns.

Toe-out is checked by turning the wheels either to the right or to the left, and locating the outside wheel in a definite position—usually 20 deg. In this position the setting of the inside wheel is checked. It should agree with the degree setting specified by the vehicle manufacturer.

Any error of the toe-out angle must be due to bent steering arms. If these arms are bent, the wheels will not turn in the proper relationship. Corrections are made by replacing the defective component. Steering arms should never be bent to establish proper toe-out. It is rarely possible that other components such as steering knuckle supports or suspension arms can be bent to cause defective toe-out. The problem is most always due to faulty or defective steering arms.

Proper wheel alignment angles have been carefully built into automotive vehicles at the factory which provide for steering safety, steering ease, and normal life of tires and steering parts. Misalignment of adjustable angles is a result of normal operation. Wheel and steering parts wear, just as other parts of the vehicle wear. A dependable national survey shows that wheel alignment "wears out" three times faster than mufflers. The same survey shows that passenger cars "burn up" alignment four times faster than spark plugs. In addition, the average vehicle "uses up" wheel balancing six times faster than brakes, or at about the same rate as oil filter cartridges.

Unfortunately vehicles will operate with misalignment and unbalance, thereby creating dangerous and expensive conditions. It's up to the front end mechanic to impress his customers with the need for dependable steering; then to follow through with a bang-up job of front wheel alignment. It's a lucrative business for the man who understands all the factors influencing alignment and the correct procedures for checking and establishing manufacturer's recommendations.

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Cold Parts Cleaner

Carburetor cleaning and overhaul, plus countless other time-consuming work on small components, is said to be accomplished faster and easier with Permatex Cold Parts Cleaner—now available in a handy bench-size container. The new gallon-and-a-half container holds a gallon of this high-

ly-concentrated, water-sealed, immersion-type parts cleaner. A metal basket is provided to hold the parts to be cleaned in the solution and to permit easy draining and recovery of the parts. Purpose of the container's extra capacity is to provide enough space for cleaning a basketful of parts without spillage.

The cleaner, developed through five years of research in Permatex's laboratory, is specially compounded to clean parts down to bare metal without damage to the parts.

(Circle No. 1 on Reader Service Card)

On-The-Car Wheel Balancer

A new on-the-car wheel balancer that permits rapid and secure installation of 12" through 16" wheels is announced by John Bean Division. According to the manufacturer, the compact balancer requires no adapters or special parts for installation . . . positive, adjustable legs permit installa-

tion on virtually any wheel, including most foreign cars.

When the balancer is securely attached to the wheel and the correct locking pressure established, "three-dimensional" indicators "pop out," enabling the operator to hear, see and feel them. When the wheel is rotated with the Spinner, the exact location and amount of weight required to balance the wheel can be found by a simple push-pull movement of the balancer controls.

(Circle No. 2 on Reader Service Card)

Dry Type Air Cleaner Tester

Any size dry type air cleaner can be quickly tested—to see whether it is clogged and causing poor gasoline economy—in a new device recently announced by AC Spark Plug Div., General Motors Corp. The tester actually measures the air flow through the cleaner. This depends on the amount of dirt concentrated on the cleaner's surface. The degree of clogging is shown by the height to which the air flow causes a ping-pong ball to rise in a plastic column.

The tester introduced by AC in 1957, when the number and sizes of replaceable air cleaners was small, compared a new air cleaner with a set standard. The new model, how-

ever, is designed to compare the used cleaner with a clean one of the same type, size for size, which is said to more accurately indicate the extent to which the used cleaner has become choked with dirt. A kit is available for converting the older models into the new version.

(Circle No. 3 on Reader Service Card)

Automatic Transmission Tester

Deltadynamics, Inc., announces a new automatic transmission tester capable of simulating actual vehicle conditions, even permitting accurate full power stall checks to be made.

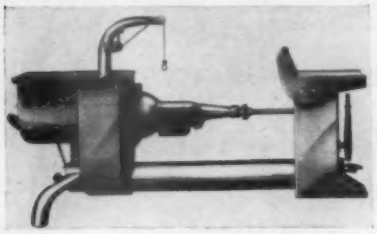
Known as the Transtestor, the unit is powered by a 45 hp., 4-cylinder engine which provides an abundance of power for scanning the entire speed range of 400 to 5,000 r.p.m., when checking the shift points and balance.

A large flywheel located in the headstock is used to store energy that is then released to expose the transmission under test to exactly the same torque as it will be exposed to in the vehicle. For checking torque, the flywheel is accelerated to a predetermined speed by the engine and the tailshaft brought to a stop and held by an aircraft type disc brake.

Torque transmitted by the transmission is determined and slippage detected by balancing the entire machine on two ball-socket mounting feet. The net input torque thus pivots

the entire machine about its mounting and operates a red signal light, indicating slippage.

A smaller flywheel located at the rear of the transmission functions to stabilize the speed of the output shaft

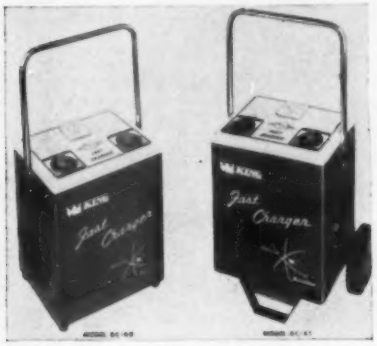


during shifts. This, according to the manufacturer, makes the shift points very apparent to the operator since the entire procedure, sounds and sensations are similar to actual vehicle operation. Thus, it is claimed, the operator needs little training or experience and can complete an effective test quickly by following the familiar procedures of road testing.

(Circle No. 4 on Reader Service Card)

New Silicon Fast Charger

A full 100 amperes at 6 volts, and 50 amperes at 12 volts is claimed for the new Silicon rectifier type Portable Model EC-60 and Wheel Model BC-61 Fast Chargers recently added to the



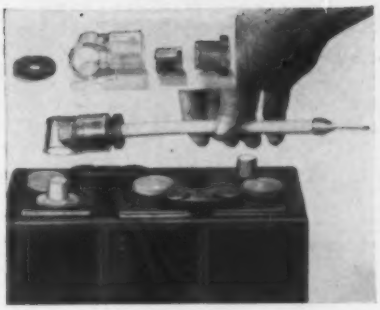
King battery equipment line. It is claimed that the rectifier is hermetically sealed in ceramic to exclude moisture, acid fumes, etc., thus permitting a 5 year guarantee by the manufacturer, who also states that an automatic-reset circuit breaker prevents damage from accidental overloads. Automatic correction for 6 or 12 volt battery charging with the output tapering to prevent over-charging, is another feature claimed for the King Chargers.

(Circle No. 5 on Reader Service Card)

Plastic Battery Cable

A new battery cable is announced by the Truck Equipment Distributors, Inc., which features a plastic cable head and threaded nylon connector nut that completely encases the battery terminal and cable end. Between the plastic head and the battery is a sodium hydroxide impregnated felt washer that is said to neutralize sulphuric acid and completely seal the terminal connection against any outside corrosion or contamination.

The plastic used in the cable head unit is tough etho-cell thermoplastic, said to be ideal for this application because it combines strength with resistance to battery acid and vapors, as well as moisture, grease or oil. Because of the positive terminal clamping action, it is claimed Radsco cables will not loosen due to vibration or expansion and can be installed and removed in half the time of conventional



cables. One style cable fits both the positive and negative terminals on either 6- or 12-volt batteries.

(Circle No. 6 on Reader Service Card)

Herbrand tool-of-the-month

improved hose clamp plier with finger-tip position lock

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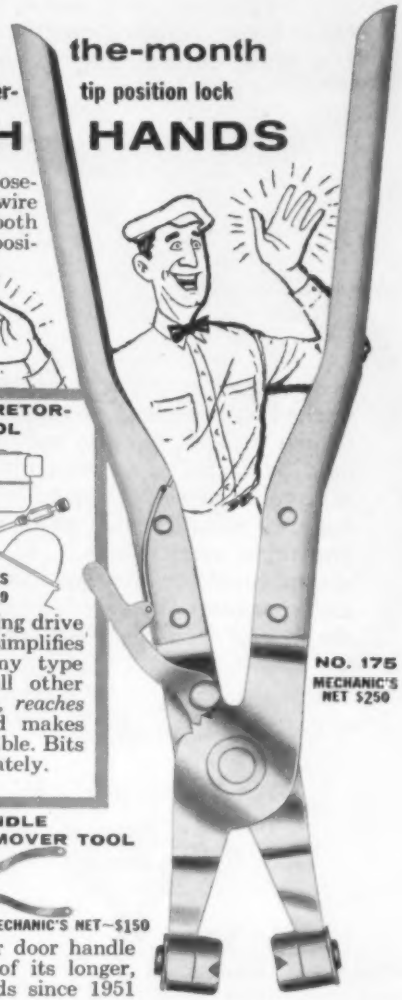

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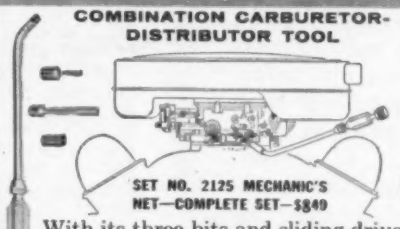

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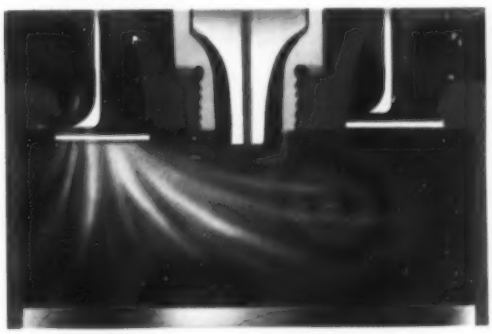

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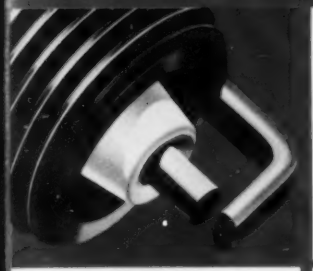

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1959 V8 Commando.....A32

PONTIAC

1955-59 V8.....A52
1959 Canadian 6 Cyl.....A52

RAMBLER

1956 6 Cyl.....AL82
1957-59 6 & V8 O.H.V.....AL82

STUDEBAKER

1951-58 V8 (Except 57 Golden Hawk)...AL82
1956 V8 Golden Hawk...AG52
1959 V8, All.....AL82

Auto-Lite RESISTOR Spark Plugs with Power Tip, recommended for long plug life and suppression of radio interference, can be used in place of all STANDARD Power Tip applications shown in these specifications.

"Mechanic On Duty" Sign

The Champion Spark Plug Co. is offering a new all-metal "Mechanic On Duty" curb sign for service stations which will enable motorists with car trouble to tell at a glance that

qualified help is available at any station displaying it.

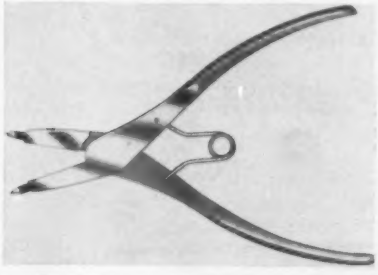
The sign has a rust-resistant baked enamel finish in three colors—black, red and white. Overall height of the sign and stand is 44 in., overall width, 29 in. The entire unit weighs less than 30 lbs. and may be removed easily when the mechanic is away.

Other features of the sign are its "spill-wind' design and extra long feet which prevent tipping over; also, it can be read from either side.

(Circle No. 7 on Reader Service Card)

Snap-Ring Plier

A versatile snap-ring plier with replaceable points is the current offering of Herbrand Tools, the Bingham-Herbrand Corp., in their popular "Tool-of-the-Month" series. According to the manufacturer, it is a "must" for



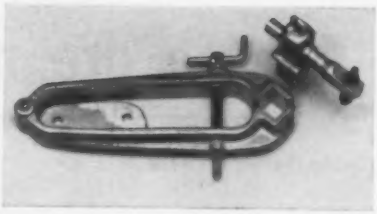
work on automatic transmissions and power brake mechanisms and has "1001 other uses" that recommend it to the busy mechanic.

Unique in design, its replaceable straight and angle tips are reversible, permitting easy access in close quarters. The plier is finished in heavy-duty, bright chrome plate and is available in two styles, one for internal and the other for external snap rings. Three sets of tips are included with this multi-purpose tool.

(Circle No. 8 on Reader Service Card)

Distributor Overhaul Fixture

Two new tools are announced by the Duey Tool Co. to speed up distributor and carburetor service. The larger tool shown here is basically a distributor holding device, and is sturdy enough to permit removal and replacement of distributor shafts and bushings. It is also said to be useful for holding planetary shafts (up to three inches in diameter) used in automatic transmissions.



The carburetor holding fixture is made of the same strong aluminum alloy and can be used mounted in a vise or in the distributor holder. It rotates the carburetor 360° for easy overhaul.

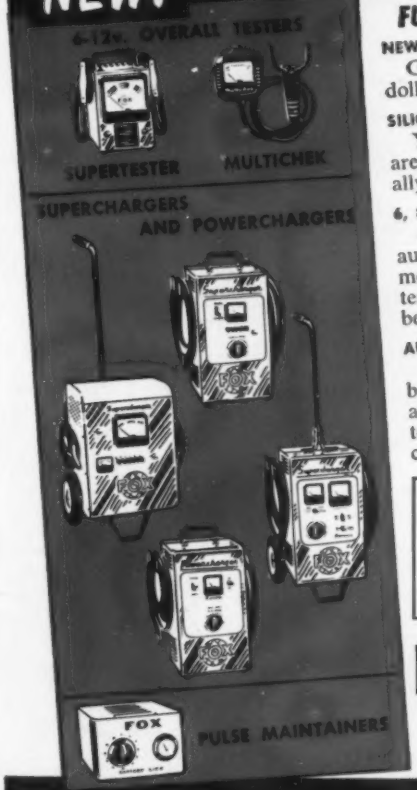
(Circle No. 9 on Reader Service Card)

PROFIT FROM MOTORIST'S NO. 1 ENEMY

More than 13,000,000 road breakdowns were caused by battery or charging circuit failures in 1957. Regular testing will stop this terrible yearly waste of $50,000,000. Regular testing will also give you a handsome profit in battery sales and charges.

Surveys show you will sell 1 battery and 3 charges every time you test 10 batteries. Fox Battery Servicing Equipment is the key to all these profits.

NEW! FOX CHARGERS AND TESTERS



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Write today for FREE "Get Your Battery Checked" SIGN and Profitable Hints on Battery Servicing. Fox Products Co., 4704 N. 18th St., Phila. 41, Pa.

FOX BATTERY SERVICING EQUIPMENT

These are new *manufacturers' products*

Brake Service Tools

An all-new eight-piece brake service tool assortment is being offered by Raybestos Division of Raybestos-Manhattan, Inc., which is said to contain the "must" tools for mechanics who want to do efficient brake service work faster on all popular auto-

mobiles including 1959 models with 3½" brake shoes. These tools which were Proving Ground tested for quality and tool design in the Raybestos Brake Service Test Headquarters Garage, are as follows:

1. Combination 7/16" x 3/8" special offset box wrench; 2. Special star adjuster spoon; 3. Brake adjuster wrench for internal expanding parking brakes; 4. 5/16" x 3/8" combination brake bleeder and cap wrench; 5. L-shaped tool to remove and replace brake shoe return springs; 6. 15/16" combination box and open end wrench; 7. 7/16" deep throat offset box wrench, and 8. Brake spring pliers.

This complete set of brake service tools is available with any of three all-new assortments of Raybestos Contour Ground Lined Brake Shoes.

(Circle No. 10 on Reader Service Card)

Small Engine Jiffy Kits

A service stock assortment of twelve Small Engine Jiffy Kits has been announced by the Hygrade Products Div., Standard Motor Products, which will give the service shop mechanic coverage for the most popular small engine carburetors made by Carter, Clinton, Tillotson and Briggs & Stratton.

Each Jiffy Kit contains a complete set of perfectly matched gaskets, needles and seats, pump piston plungers, economizer valves, small parts, instructions and gauges.

The assortment is packaged in a blue and yellow dispenser-display, suitable for either wall mounting or counter top. Besides making the stock clearly visible, it has an illustrated display board, and an application guide printed on the side panels.

(Circle No. 11 on Reader Service Card)

Wheel Bearing Service

With this new Bower-BCA Wheel Bearing Service Cabinet, being offered by Federal-Mogul Service, every service outlet can go after a share of the highly profitable wheel bearing

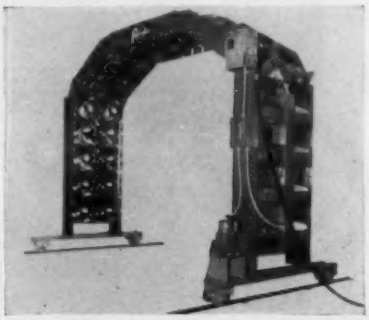
replacement market.

Included are basic stocks of Bower tapered roller bearings and BCA wheel ball bearings; an accurate, chrome-plated torque wrench; an application and price card; and an illustrated folder of installation instructions. All come pre-packaged in a sturdy steel cabinet with a colorful enameled display front.

(Circle No. 12 on Reader Service Card)

"Junior" Size Infrared Unit

A traveling infrared "Durabake" oven of improved design, and engineered expressly for small-to-medium



shops, is announced by The Fostoria Pressed Steel Corp.

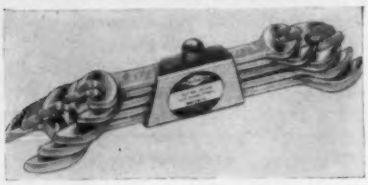
Although a compactly built oven only 4'-1" in outside length, 7'-5" high and 9'-6" wide, the new "Mobil-Dry Jr.," Model 414V is sufficiently large to accommodate passenger cars and panel trucks up to 6'-3" high and 7'-8" wide. More than 27 feet of double track and an 18-foot cable is supplied as standard equipment with the unit, which is powered by a specially-designed motor drive unit. Length of travel is adjustable and the mobile oven reverses itself automatically.

The unit is equipped with Fostoria-patented high-specular gold reflectors designed to eliminate hot-spotting and distribute uniform paint film temperatures over the car surface without preheating delays. Three bank switches control left, right and top infrared sections.

(Circle No. 13 on Reader Service Card)

Metric Wrench Set

An attractively priced set of open-end metric wrenches is announced by S-K/Lectrolite Tools, which contains five wrenches, with openings of 8 mm



x 9 mm, 10 mm x 11 mm, 12 mm x 13 mm, 14mm x 15 mm and 16 mm x 17 mm.

The wrenches are nickel-chrome plated and have polished heads; they are precision milled, carefully tempered and are fully guaranteed.

(Circle No. 14 on Reader Service Card)

Spring Pad Inserts

O.E.M. Products Co. announces a new leaf spring pad insert which is said to be a sure cure for squeaky leaf springs.

Made by an intricate weaving process which produces a sturdy one-piece body, the inserts are thoroughly impregnated with high-melting-point compounds, specially formulated to individual spring requirements.

According to the manufacturer, these inserts cannot grow brittle like plastics, and make noise when equipment is used in dry sandy areas; nor will they create dry friction like aluminum and hard rubber; wear out like soft rubber, or discard webbing and other surplus materials sometimes used.

(Circle No. 15 on Reader Service Card)

Hydraulic Transmission Jack

A new, 2-stage, pedestal type transmission jack for under-lift servicing of automatic transmissions is announced by Walker Mfg. Co. of Wisconsin.

Equipped with a 2-stage hydraulic ram that provides a low load pick-up height of 37 in., and a maximum load pick-up of 73½ in., the jack's lifting head tilts from 80° forward to 18° backward, and the transmission can be "axis-rotated" to provide perfect alignment of locating dowels and bolt holes on the bell housing.

Pedal pump pivots around the pump cylinder for easy accessibility from any position, allowing freedom of both hands to guide the transmission as the ram is raised. Two-speed release allows gentle, accurate descent in tight places and a rapid descent when transmission is free. The U-type safety release bar can be easily reached from any position.

Tip-proof maneuverability is provided by an extra heavy welded-steel tube quadruple-leg base with the proper strength and width necessary for maximum stability at full height under the load.

Unit comes complete with a universal lifting head, including a full set of adjustable pick-up blades for all automatic transmissions, and an adaptor head for Chevrolet Powerglide.

(Circle No. 16 on Reader Service Card)

Wireklad Truck Brake Sets

Johns-Manville announces a popular-priced line of improved Wireklad brake lining truck sets covering the full range of truck applications. According to the manufacturer, Wireklad brake lining gives uniform, balanced braking whether hot or cold, wet or dry for trouble-free service.

(Circle No. 17 on Reader Service Card)

Parts Cabinet

United Motors Service division of General Motors offers a new parts cabinet, described as bringing a "one cabinet approach" to more efficient merchandising and better inventory control of replacement parts for automotive service shops.

Available through UMS distributors, the cabinet is six-feet high, three-feet wide, one-foot deep. Made of heavy gauge steel, it provides nine adjustable shelves and an attractive header sign.

(Circle No. 18 on Reader Service Card)

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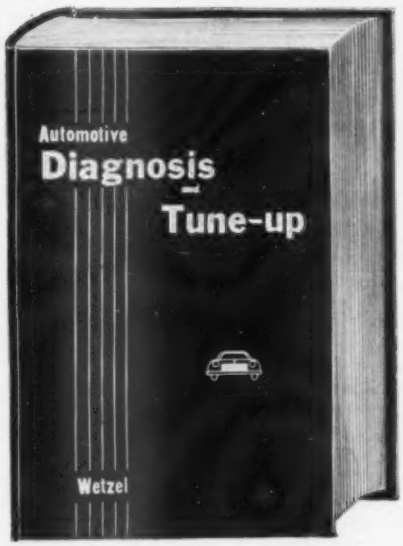

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Use on *all* acrylic finishes. Proven on original acrylic-finished cars – now, most new cars have this finish. Cleans and polishes with a quick, light rub. Leaves a protective coating.

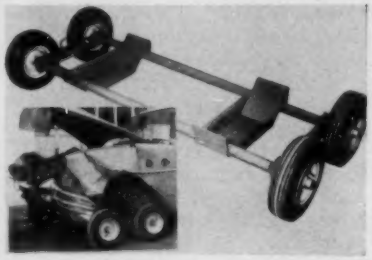
SEE MORE PERMATEX PRODUCTS FEATURED ON PAGE ONE

These are new *manufacturers' products*

Towing Dolly

Ernest Holmes Co. announces a new portable towing dolly specifically developed for handling wrecks damaged to the point where they cannot be towed with conventional equipment, as well as for handling automatic transmission equipped cars without having to uncouple the drive shaft for towing.

The Speed King Dolly can be quickly disassembled and carried with the wrecker on every service call—four self-locking pins are said to permit assembly or disassembly in less than one minute.



Little trouble is encountered in positioning the dolly for towing from either end. Using the wrecker, the operator simply lifts either end of the disabled car and rolls the dolly in position. The wheel assembly of the car to be towed is then lowered into the wheel wells, which are adjusted for the width of the car and locked in a fixed position. Due to the unusual shape and size of the wheel wells, the car-in-tow is said to be held firmly in place without the need of chaining or clamping the car to the dolly. When on the dolly, cars are towed in a relatively level position, which means there is no bumper drag, even on air suspension models.

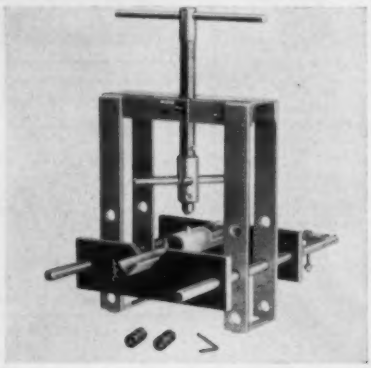
The towing dolly has a capacity of 2,900 lbs., a maximum towing speed of 50 m.p.h., and may be efficiently used with most any type wrecker, including small service station models.

(Circle No. 19 on Reader Service Card)

Low-Cost Shop Press

Frank N. Wood Co. announces a new, low-cost, manual utility shop press designed especially for generator and starter repair work, but equally as useful for many other jobs around the shop.

Special attachments to make repair



jobs easier are included as standard equipment. For example, the pole shoe support with spring-loaded center simplifies installation or removal of pole shoes without damage to the generator or starter case. Heavy steel beds are notched on one side to hold the pole shoe support or for other applications requiring a V-rest. Pole shoe screw driver has three interchangeable bits; with a #3 Phillips bit available for special work.

(Circle No. 20 on Reader Service Card)

Holley Carburetor Repair Kits

A new line of low cost carburetor repair kits is announced by the Holley Carburetor Co. with which a mechanic will be able to provide on-the-spot carburetor tune-ups and minor repairs. Called Pep Kits (P for power, E for economy and P for performance), the kits contain needle and seat assemblies, gaskets, power valves and an accelerating pump diaphragm or pump plunger.

Holley's minor repair kits are now available for all Holley carburetors and Ford-designed carburetors in the field. There are kits for Ford, Mercury, Edsel, Lincoln and American Motors cars. Complete instructions are included in each kit, making repairs relatively simple.

Currently Holley is offering a Kent-Moore adjustable float gauge, which simplifies float settings, with purchase of each ten kits.

(Circle No. 21 on Reader Service Card)

Air Conditioner Service Unit

Kent-Moore Organization announces a portable air conditioner charging-checking unit which permits a shopman to evacuate, charge and gauge automobile air conditioners quickly and easily on the car, simply by connecting two hoses and adjusting clearly labeled valves. The unit consists of a vacuum pump, Freon supply, gauges, valves, and a five-pound metering-charging cylinder.

(Circle No. 22 on Reader Service Card)

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2. Air Agitated soaking tank
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PRACTICAL MFG. CO.

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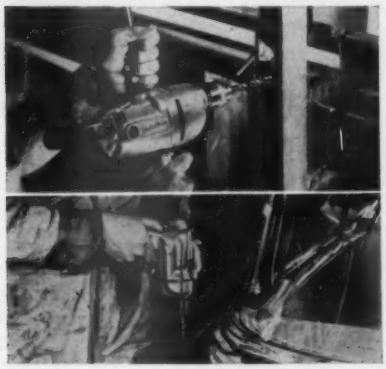
Two New Black & Decker Drills

Two new additions to its line of portable electric drills has been announced by The Black & Decker Mfg. Co.

First a completely new ½" Special Drill (Cat. No. 679), with a 62% power



increase over previous models, has been introduced for drilling diameters up to ½" in steel, ¾" in masonry, 1" in hardwood, and driving hole saws up to 2". The new drill weighs only 7½ lbs. and features a geared chuck and key, 3-conductor cable and rubber key-holder, "instant-release" trigger switch, and a low price tag.

Next, the company is offering an all-new, low cost ¼" drill (No. 680) for use in light automotive work. Weighing only 3 lbs., the unit has a drilling capacity up to ¼" diameter in steel, and ½" diameter in hardwood. It is also capable of driving hole saws up to 1⅛" diameter in any material a hack saw will cut.

(Circle No. 23 on Reader Service Card)

Radiator Cap Wrench

Burns from overheated radiators and radiator caps are said to be a thing of the past, thanks to a new radiator cap wrench being offered free to shop operators by Mac's Super Gloss Co., Inc.,

with the purchase of two dozen cans of their No. 13 or Sealer and Stop Leak (or any combination of the two).

The new wrench is made of heavy duty nylon and has a built-in magnet in the handle. The shop operator can remove the "hot" cap without ever touching it and hold it within the wrench while he is checking or filling the radiator. The lifetime magnet permits him to "hang" the wrench conveniently on any metal surface.

(Circle No. 24 on Reader Service Card)

One-End Car Lift

This Hi-Jak air or hydraulically operated car lift, recently announced by Beverly Equipment Engineering Co., has a capacity of 3,000 lbs., and a 40" lift. The unit features adjustable fingers permitting its use on all makes of cars, both domestic and foreign,

and is said to eliminate possibility of damage to vital parts of the car. It can be used to lift front, rear or sides, by cross members, A-frames or bumpers.

(Circle No. 25 on Reader Service Card)

"24 Minute" Scope-Analyzer

A new Scope-Analyzer, with which it is said to require only 24 minutes to tune the average car, has been announced by Allen Electric and Equipment Co.

The new unit combines the advantages of conventional metered equipment with the fast diagnostic ability of the ignition scope. In operation, ignition faults are pinpointed on the ignition scope. The individual test instruments are then used to tune the engine to recommended factory specifications. The results of each tune-up can be quickly proved to the customer by using the scope to display the corrected pattern.

The new Scope-Analyzer (Model 27-09) includes the Allen Scope, Scope Dial-Chek, distributron (measures ignition output, timing and distributor advance), Dwell-Tach-Volt Tester, Volt-Amp Tester and Combustion Analyzer. All units, including the ignition scope, can be removed from the cabinet and used anywhere.

(Circle No. 26 on Reader Service Card)

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(Jobber inquiries invited)

These are new *manufacturers' products*

Heavy-Duty Electric Impactool

A new ½" drive heavy-duty electric Impactool, recently announced by Ingersoll-Rand Co., is said to deliver 25% more power than standard duty ½" drive tools. With it, mechanics can capably handle all but the largest nuts and bolts more easily, as well as speed up difficult universal joint and angle head jobs, rocker arms, upper control arm replacements, etc.

In spite of this heavy-duty power bonus, the new model 5U-HD is said to be lighter in weight and easier to handle than comparable ½" drive electric tools. It is 10¼" in length and weighs only 6 lb., 4 oz., less cable. Side to center distance is 1-7/16". The tool delivers 1900 impacts per minute, runs at a free speed of approximately 1900 r.p.m., and is available for 110V AC-DC operation.

Although developed primarily for automotive nut running use, with standard attachments, which can be easily and quickly applied, it will drill, drive screws, ream, tap, do wire brushing, hole sawing, etc.

(Circle No. 27 on Reader Service Card)

Parts Cleaning Kit

Gunk Chicago Co. announces a new three gallon bench kit for cleaning carburetors and other small parts.

Gunk Hydro-Seal is a paint stripper and metal cleaner, as well; also dissolves varnish and built-up deposits in carburetors.

Handy cleaning basket keeps hands out of cleaner . . . hooks over sides of can for draining.

(Circle No. 28 on Reader Service Card)

New Britain Redesigns Ratchet

Wedge action of a 12-tooth pawl engaging a 60-tooth gear is the principle of a New Britain ratchet design. According to the manufacturer, The New Britain Machine Co., the redesigned unit is so rugged that even after a quarter million heavily loaded test pulls, production models showed no measurable wear.

Important features to every mechanic are lightweight, small head, and short swing that speed up work in close areas. It is reported that only about an inch of swing is needed for this ratchet wrench to take another bite. The one piece ratchet assembly is easily replaceable, and has a friction-free seal to keep dirt out and lubricant in.

(Circle No. 29 on Reader Service Card)

Now... true acrylic colors for refinishing with Ditzler's

Acrylic Color Mixing Service

Exact-weight scale for precise mixes.
Smooth-running, quiet power agitator.
DITZLER Color Mixing Service
Complete line of DURACRYL® base colors.
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Now you can match all the acrylic colors on many of today's cars with Ditzler's Acrylic Color Mixing Service.

• **Ditzler offers** a complete new series of DURACRYL base colors and hundreds of laboratory-tested formulas. *These colors are true acrylics, not modified lacquers.* With them you can duplicate the beauty and depth of color, high gloss and durability of modern acrylic finishes.

• **With this mixing service,** you can mix these colors as easily and quickly as conventional lacquers. You can prepare the amount you need when you need it.

• **Ditzler's Acrylic Color Mixing Service** gives you added opportunity for profitable business on millions of new cars originally finished with acrylics. Get in touch with your nearest Ditzler jobber for further information.

• DURACRYL *is now being used on the production lines by all car manufacturers using acrylic finishes as original equipment.*

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PITTSBURGH PLATE GLASS COMPANY
IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED

Forming Tool Speeds Body Work

Stanley Tools, division of The Stanley Works, announces a new convex plane-type forming tool for filing and forming recessed areas . . . ideal for shaping and forming plastic and metal

fillers, spot trimming and smoothing curved and recessed areas on body repairs and customized auto body work.

Two knobs make it a draw-cut or push-cut tool with equal ease, the cutting being done with a hardened, tempered steel blade that will not clog . . . chips pass through the blade and each cutting edge has its own throat which carries shavings away from the work.

(Circle No. 30 on Reader Service Card)

Pistol Grip Electrode Holder

A new pistol grip electrode holder, recently announced by Frank Niemi Metal Products, Inc., has built in safety cut-out to prevent accidental "flashes" or shocks—the instant grip is released, current is off. Advantages

claimed by the manufacturer for the new holder include: tip grip on electrodes, permitting use of electrodes down to a short stub; heavy-duty milled copper jaws adjustable to different rod diameters; push button stub ejector; and a "natural" pistol grip which is said to give greater visibility at point of work.

Case of the Handi-Arc is made of high impact pheonolic plastic, and is bright red in color to stand out while on bench or floor. All working parts are of machined copper and a receptacle in handle accommodates self-clamping attachment of lead cord.

(Circle No. 31 on Reader Service Card)

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☐ Automotive jobber
☐ Fleet operator
☐ Service station
☐ Other _____

Instrument Corner . . .

(*Continued from page 8*)

of exhaust gases in the fuel-air mixture drops, but it may be 30 per cent or more."

The boys had to agree that this sounded reasonable as a possible cause of the mysterious carbon formation. Although not common, it does happen occasionally.

Breaker Point Problems

"Speaking of distributor contact points," the Instrument Man said, "There are things that few of the men who work with them day after day, know or think about. For example, the stationary point is rounded with a ¾-inch radius, and the movable point is flat.

"As a matter of geometry, the actual metal-to-metal contact of new points is a point. However, due to the tension of the breaker arm spring, there is a slight flattening of the curved surface, so that the contact area becomes a circle about 0.02" in diameter. This amounts to about thirty-one hundred thousandths of a square inch. With up to three amperes flowing through this area, how many amps would that be per square inch? Let's figure it."

He took a pencil and paper and found that it would be close to 9,678 amperes per square inch, which is a pretty high current concentration.

"Of course," Jim went on, "this terrific current rate does not last very long. With use, the contact area rapidly becomes greater, until finally the points make contact across their full area. The contact area is then made up of two mating surfaces, somewhat rough, but matching perfectly.

"Now, if the points are readjusted, it is quite likely that the movable point will be in a slightly different position after adjustment. Then the surfaces will not mate exactly; there will only be contact between the high spots on the two points. This steps up the current flow concentration again, until the surfaces once more become mating surfaces."

COLD WEATHER HARD ON POINTS

Jim pointed out: "This matter of current concentration explains why there are so many failures during the kind of cold weather we had this winter. Suppose for example, that you put in a set of new points, and the temperature is ten degrees below zero outside. When the engine is started after setting all night in the cold, the coil is cold, and the resistance of the primary winding is lowered. The voltage regulator is cold, so that it will pass more than the voltage for which it is set at normal operating temperature. The battery is cold and sluggish, so that its counter EMF is higher than normal; and it will take high generator voltage to make it accept charging current.

"All these factors make the primary current going through the points much higher than normal. As a result, new points, points which have relatively poor contact with each other, and recently adjusted points, are very liable to be burned."

"That certainly sounds logical to me," Bill said, "though I never thought of it that way. We did have more than usual point replacements during the cold spell."

"There is another thing about points that I want to mention," said the Instrument Man, "regarding the amount of unnecessary point changing being done. Here are pictures of a couple of sets of points that I took. The set with the hollow stationary point is off my '55 Mercury. These points went 25,000 miles and were working perfectly when I took them out and replaced them.

"You can see the somewhat rough contact surface, but these points were never adjusted after they were properly installed, so the surfaces have been perfectly mating contacts after the initial spherical surface was worn

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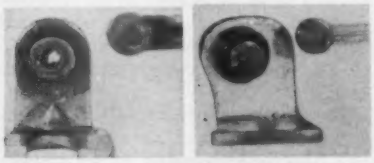
away. The only reason I changed them was that I couldn't be sure how much metal was left and didn't want to take a chance on their failure when out on the road. But you can see that they're no argument for the idea of changing points every 5,000 miles.

"The other set was taken out after about 4,000 miles of driving. They are



Breaker points at left were still giving excellent contact after 25,000 miles (the hole in the stationary point is for ventilation). Set at right is still in very good condition after 4,000 miles of operation.

in perfect condition, with the spherical surface not even fully worn off of the stationary point. Yet when the car was tuned, out came the points; and new ones were put in."

"I agree with you," said Tom, who up to this time had done nothing but be an attentive listener, "but there is another angle to consider. Suppose I find the points on a car that I am tuning are in good condition, looking as if they would be good for at least another 5,000 miles.

"So I save the customer the price of a set of points. Then 2,000 miles later, for some reason, the points go bad. The customer comes back to me and says, 'What kind of a tune-up man are you? You tuned up my car and didn't even put in new points, and now I need new ones.'

"On the other hand, I put new points in, even if they aren't needed. They go bad in 2,000 miles, and the customer comes back to me to complain. I tell him, 'I'm very sorry, sir, but I put in new points and they were perfect when the car left here. Something must have happened to make them fail that was no fault of the work that I did.'

"Now I ask you, Jim, which is the better thing to do? Save the customer a buck or two and possibly give him a good reason to complain, or put in new points and let him pay for them?"

"You have a good point there," replied Jim, "and the same thing is true about condensers. I never yet have had a condenser fail on me, and I never change condensers on my own car. But if I were doing tune-up work as you boys are, I suppose I would change points and condensers the same as you do. After all, you want to keep the customers happy and satisfied so they will come back and send in their friends."

Engine "Knock" Laid to Oil Pump Pan Screen

A loud tapping noise or knock in a 318 cu.in. V-8 Plymouth engine during idle may be caused by the oil-pump suction screen striking the bottom of the oil pan. This noise, according to the manufacturer, is definitely governed by engine temperature and does not occur at idle speed until the car has been operated a considerable distance.

A similar condition can be obtained in the shop by restricting the air flow through the radiator.

If this condition is encountered, it may easily be corrected by draining the engine oil and providing clearance between the oil pump screen and the oil pan by using a long screwdriver or a similar tool.

Chevrolet Revises Brake Adjustment Specs

Chevrolet has revised brake adjustment specifications for its 1959 passenger cars equipped with standard production organic linings.

For maximum lining life, '59 brake shoes should be backed off 12 notches after light uniform drag is felt on the drum. Previous specifications called for backing off seven notches.

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Noisy or Erratic Starter Motor Drive

Noisy or erratic operation of the starter motor drive, according to a recent Plymouth Service Bulletin, may be caused by small amounts of foreign material on the threads of the Bendix drive. This condition may be more prevalent on cars equipped with air cooled automatic transmissions. However, an inspection may be made on any vehicle without removing the starter assembly.

A check can be made on cars with automatic transmissions by removing the inspection plate at the bottom of the torque converter housing. Standard transmission-equipped cars can be checked by removing the clutch housing pan located at the bottom of the clutch housing.

If the accumulation of foreign material is slight, apply a few drops of No. 10-W oil. A pressure-type oil can with a seven-inch extension of small copper tubing attached to the spout will aid lubrication at this point.

If an inspection indicates that an excessive amount of foreign material is present, it will be necessary to remove the starter assembly for thorough cleaning and lubrication with a light film of Lubriplate.

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How to Check Lube Level In Chrysler Rear Axles

When checking the lubricant level in the rear axles of 1957-'59 Chryslers and Imperials while the car is on a hoist or lift, the factory recommends that the hoist used be one that lifts the vehicle by supporting under the wheels or under the rear axle housing and the front suspension lower control arms. This type of hoist maintains the rear axle housing at normal driving angle; hence, an accurate check of the lubricant level can be made.

The use of any hoist which lifts the frame of the car and allows the wheels and rear axle housing to be unsupported will change the angle of the rear axle housing and an accurate check of the lubricant level cannot be made.

A Warning from Dodge On Interchanging Tappets

All of the various hydraulic tappets used in Dodge passenger cars are interchangeable to date, *with one exception.* According to the Dodge Service Department, the 1959 326 cu-in. Coronet "A" engine uses a tappet with the oil feed groove located higher on the tappet body, the "A" engine block having the oil feed passages correspondingly higher.

Should a 1959 "A" engine tappet be used in any other Dodge engine (any year) or any other tappet be used in the '59 "A" engine, the result will usually be a noisy tappet due to insufficient lubrication.

To make your shop more profitable . . . your time more valuable . . . be sure to read this month's "These Are New" section

"You know that costly body job in the shop, Boss . . . It's a stolen car."

BRUSHING UP ON THOSE

EASY-TO-FORGET THINGS

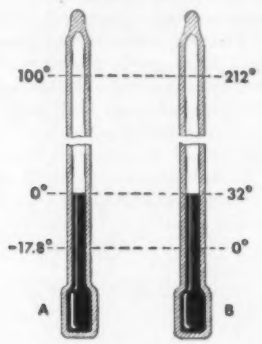
Refresher course

Fahrenheit vs. Centigrade

• CONVENTIONAL THERMOMETERS make use of the fact that most liquids (mercury, alcohol) expand when heated and contract again upon cooling.

The distance on the stem between two fixed points on a thermometer is divided into equal spaces, called degrees. In the Centigrade thermometer, A, the freezing point is marked zero (0) and the boiling point is marked one hundred (100). The divisions extending below the zero point are called degrees below zero or minus degrees.

In the thermometer scale devised by Fahrenheit (B) in 1714, the freezing point on the scale is marked 32 degrees (32°) and the boiling point 212 degrees. The portion between two points is divided into 180 equal spaces.



Degree markings on the scale of a thermometer in degrees Centigrade (A) and degrees Fahrenheit (B).

Therefore, 100 divisions on the Centigrade scale are equivalent to 180 divisions on the Fahrenheit scale, and one division Centigrade is equivalent to 9/5 divisions Fahrenheit.

In changing temperature expressed on the Centigrade scale to one on the Fahrenheit scale, it must be remembered that 0°F. is 32 Fahrenheit degrees below 0°C.

For example, 68°F. is 68-32, or 36 Fahrenheit degrees above the freezing point, and 36 Fahrenheit degrees are equivalent to 5/9 x 36, or 20 Centigrade degrees. Since the freezing point is 0°C, then 20 Centigrade degrees above this point is 20°C. Hence, 68°F. is equivalent to 20°C.

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The Cleaning Tank . . . *(Continued from page 20)*

- **Pumps or impellers.**
  Circulation pumps or impellers can be used to agitate the cleaning solution.
- **Movement of parts in the solution.**
  This is one of the most effective methods of agitation. The moving parts create an ever reversing motion that moves the cleaning solution against all surfaces of the part and through interior passages and recesses. Cleaning time is reduced because foreign material is sheared off as soon as the bond to the metal surface has been broken.

  The movement of the parts should be snappy and brisk. Under these conditions the cleaning solution comes into contact with the parts at a considerably greater velocity than when the solution is agitated.
- **Compressed air.**
  The cleaning solution can be agitated with compressed air introduced into the tank through special nozzles.
- **Heating.**
  Movement of the cleaning solution is created by heating and boiling. Heat should be applied only to cleaners designed for this purpose and only in cleaning tanks designed for hot tank cleaning.

There is little to choose between the way the parts or cleaning solution are agitated or placed in motion. The important point is that the cleaning solution be agitated in some way. Results gathered from observations of automotive shop cleaning installations indicate that cleaning speed can be increased as much as ten times by proper agitation as compared with cleaning by still tank methods.

RINSING AND DRYING

Rinsing and drying are the final steps in the cleaning process. Parts removed from a cold tank cleaner may be rinsed with a stream of water, air and water, or an air and solvent spray. The air and solvent spray is recommended to provide a light, rust inhibitor film for parts that will not be used immediately. Parts cleaned in a hot tank solution may be rinsed with a stream of water, air and water, or a chemical vapor spray.

The primary purpose of the various rinsing processes is to remove the cleaning solution and loosened dirt. Special rinses to remove rust and corrosion and to protect the clean parts are also available. Generally the anti-rust and anti-corrosion rinse is applied after the parts have been cleaned and rinsed.

The parts can be dried easily with an air gun after the cleaning and rinsing operations are completed. Parts cleaned in a hot tank cleaner usually retain enough heat after a quick rinse to speed the drying process.

SHOP ARRANGEMENT

Cleaners are installed in the shop to enable the mechanics to do a better service job faster and to stay cleaner and keep the shop cleaner in the process. The cleaners should be located where they will be most convenient to the shop as a whole.

In smaller shops the cleaner can be located in some convenient corner of the repair department. The small shop generally can use a hot or cold tank cleaner and a pre-cleaner, such as a steam cleaner, solvent spray unit, or a chemical vapor unit.

Medium size and larger shops may require more than one cleaner. Some shops provide a parts cleaner adjacent to each mechanic's bench. This has advantages because a

mechanic would never be delayed while waiting to use the parts cleaner. Installing a parts cleaner between every other work position is another good way of eliminating lost production time caused by mechanics waiting to clean parts.

A cleaning tank location along an outside wall generally simplifies the problem of providing adequate ventilation of fumes or steam rising from the cleaning solution. If an outside wall location is not practical a suitable vent can be installed at the cleaner location.

Engine blocks and similar large assemblies can be handled easier if the trolley hoist system serves the cleaning equipment. The trolley and hoist should extend from the repair area when the cleaning tank is located adjacent to each mechanic's bench. The trolley system can be extended over a number of repair locations when the cleaning equipment is installed in a centralized location.

Shops handling a large number of engines, transmissions and other heavy parts each day may require a more elaborate cleaning set-up. The cleaning operation can be set up on an assembly line with certain cleaning jobs handled on a specialized basis, as follows:

- Disassembly and pre-cleaning on a conveyor belt. Steam cleaners can be used to advantage in this operation.
- Preliminary cleaning of internal surfaces.
- Small parts from individual sub-assemblies can be placed in separate baskets.
- Parts requiring rust and corrosion removal can be routed to a specific cleaning tank.
- Parts from which carbon must be removed can be placed in a separate cleaner.
- Parts free of carbon can be placed in another cleaner.
- Rinsing and drying operations can be located conveniently as the parts move from the cleaning room back to the repair locations.

Generally, the cleaning schedule of these larger semi-automatic cleaning operations is controlled by a fixed time table. This helps provide a uniform quality for the overall cleaning job.

Shop requirements and routines should be reviewed at periodic intervals to be sure that the parts cleaning equipment is adequate for the needs of the shop. Reviews of this type are important for any shop function.

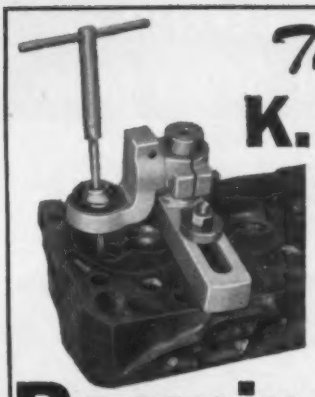
Excessive Clutch Pedal Pressure Due to Misadjustment

If complaints of excessive clutch operating pressure are encountered on Dodge 800 and 900 model trucks, the clutch linkage should be inspected. According to the Dodge Service Department, misadjusted linkage can produce an "overcenter" condition causing very hard clutch disengagement.

The linkage in question consists of the clutch release shaft lever (P/N 1664490-P), that turns free on clutch release shaft. This lever is connected through a link to the clutch pedal. A clutch pedal adjusting arm (P/N 1269807-P), is splined to the clutch release shaft. This arm has an adjusting screw on it that is used for setting clutch free play.

To adjust the clutch, place the clutch pedal adjusting arm (P/N 1269807-P), on a spline so that when the clutch release shaft lever (P/N 1664490-P), contacts it, the clutch release shaft lever will be at approximately a 1 o'clock position. That is, the lever will be slightly to the right of the vertical centerline when viewed from the left side of the truck.

Clutch pedal free play can then be adjusted by moving the adjusting screw on the adjusting arm.



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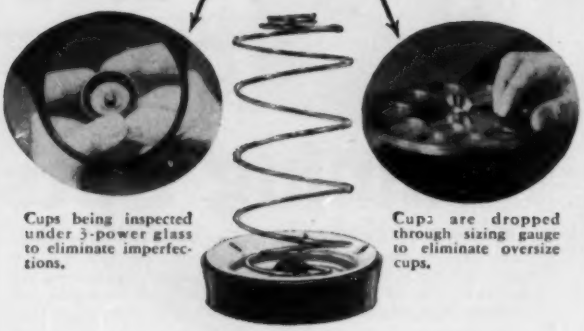

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Bear Marks 26th Anniversary As Official Service at the "500"

Continuing an annual arrangement extending back to 1930, Bear Manufacturing Co. will again be the official Alinement and Balancing Service at the Indianapolis race this year, President Victor B. Day has announced. It will be the 26th consecutive Classic at which the company has served in that capacity.

Weeks before the race, Bear technicians will be busy

at the track straightening frames, alining and balancing wheels. Then before the race is run, it is mandatory that each car have its wheels balanced and alined. A racer with unbalance or misalined wheels would never finish the event without several tire changes, Day points out, because the tires would tear themselves to pieces at the high speeds.

In servicing the 500, the firm balances more than 2,000 wheels, alines more than 70 cars—some of them six or seven times each. Race officials and other experts agree the service is one of the most vital factors in reducing the possibilities of accidents on the track.

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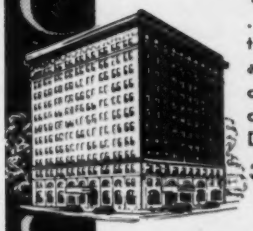

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May 17-20—Automotive Engine Rebuilders 37th Annual Convention, Royal York Hotel, Toronto, Ontario, Can.

June 24-27—Independent Garage Owners of America, Inc. (IGOA) National Convention, Albany Hotel, Denver, Colo.

Sept. 14-17—National Auto Accessory & Parts Exhibit, Exhibition Hall, Las Vegas, Nevada

Sept. 27-29—Southeastern Automotive Marketing Assn., First Convention, Biltmore Hotel, Atlanta, Ga.

Oct. 28-30—Automotive Parts Rebuilders Assn., 12th Annual Convention, Hotel Roosevelt, New Orleans, La.

Nov. 2-5—Automotive Warehouse Distributors Assn., Annual Convention and Manufacturers'-Distributors' Conference, Muehlebach Hotel, Kansas City, Mo.

Nov. 13-15—Calif. Automotive Wholesalers Assn., Convention, Miramar Hotel, Santa Barbara, Calif.

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HE WHO LAUGHS, COME WHAT MAY,

WILL LIVE TO LAUGH ANOTHER DAY

Short circuit smiles

One blistering hot day when they had guests for dinner, a mother asked her four-year-old son to say the blessing. "But, Mother, I don't know what to say," he protested.

"Oh, just say what you've heard me say," she told him.

Obediently he bowed his little head and said, "Oh, Lord, why did I invite those people here on a hot day like this?"

★ ★ ★

A beautiful girl, emerging from a secluded spot in the river where she had been swimming a la natural heard a rustling in the bushes.

"Who's there?"

"Willie."

"How old are you, Willie?"

"Eighty-nine, dern it."

★ ★ ★

One of the airlines made it a practice to give its passengers sticks of gum which were labeled: "To prevent unpleasant ear pressure during takeoffs and landings."

On one trip, an elderly woman plaintively appealed to the stewardess: "Help me get this stuff out of my ears. It hasn't done me a bit of good, anyway."

★ ★ ★

Old Lady: "The weather here in Florida is so wonderful all year around, how do you tell summer from winter?"

Hotel Clerk: "In winter we get Cadillacs, Lincolns and stuffed shirts. In summer we get Chevrolets, Fords and stuffed shorts."

★ ★ ★

When Joe learned of the birth of his first grandchild, a friend asked how it felt to be a grandfather. "It's good news, of course," Joe replied, "but I'll have to get used to the idea of being married to a grandmother."

A Salvation Army lassie approached a Scotchman and asked: Won't you give me 50c for the Lord?"

"How ol' are yee, lassie?" asked the Scot.

"I'm 21," she replied.

"Well, now I'm nearly 85 and it's vera likely I'll see the Lord before you do, so I'll give it to 'im m'self."

★ ★ ★

A suburban father is wondering what his daughter's teacher thinks of him. Seems that he had to borrow a dollar from his thrifty and money-conscious first grader one night to pay the paper boy. The next morning he got to worrying lest he had taken her lunch money; so he hurried to the school, knocked at the classroom door and asked to speak with her. "Do you have any money?" he asked anxiously.

"Yes," she answered in cool tones audible to the teacher, "but you can't have any more. I gave you all I could spare last night."

"You're kidding . . . he's not *really* the new service manager!"

A staid gentleman, honorary judge at a horse show, was upset by the dress of some of the girls. "Just look at that young person with the poodle cut, the cigarette and the blue jeans," he decried to a bystander. "Is it a boy or a girl?"

"It's a girl. She's my daughter."

"Oh, forgive me, sir," apologized the old fellow. "I never dreamed you were her father."

"I'm not," snapped the bystander. "I'm her mother."

★ ★ ★

The fact-finding youngster faced his mother one day, asking:

"Didn't you tell me the stork brought me?"

"Why, yes, dear."

"And I weighed eight pounds?"

"Yes."

"Well, for your information," said the boy, "the stork hasn't the wingspread to carry an eight-pound load!"

★ ★ ★

Among the spectators watching a famed Mexican matador perform in the bull ring was an outspoken Texan. The fight reached the stage where the matador, armed with only his cape, was taunting the bull to charge him. He avoided the animal's sharp horns only by inches, and flipped the cape aside as the bull roared past. He did this several times, until the Texas cowboy could stand it no longer. He got to his feet and shouted, "Bud, he ain't never going to run into that sack unless you hold it still!"

★ ★ ★

Have you heard about the two engaged nudists who decided to break it up because they had been seeing too much of each other?

★ ★ ★

"I want some elephant cartridges," said the customer.

"Certainly, sir, how many?" inquired the clerk.

"Oh, about a thousand," replied the customer.

"May I inquire, sir," asked the surprised clerk, "why you wish so many?"

"Because," replied the customer, "I hate elephants."

★ ★ ★

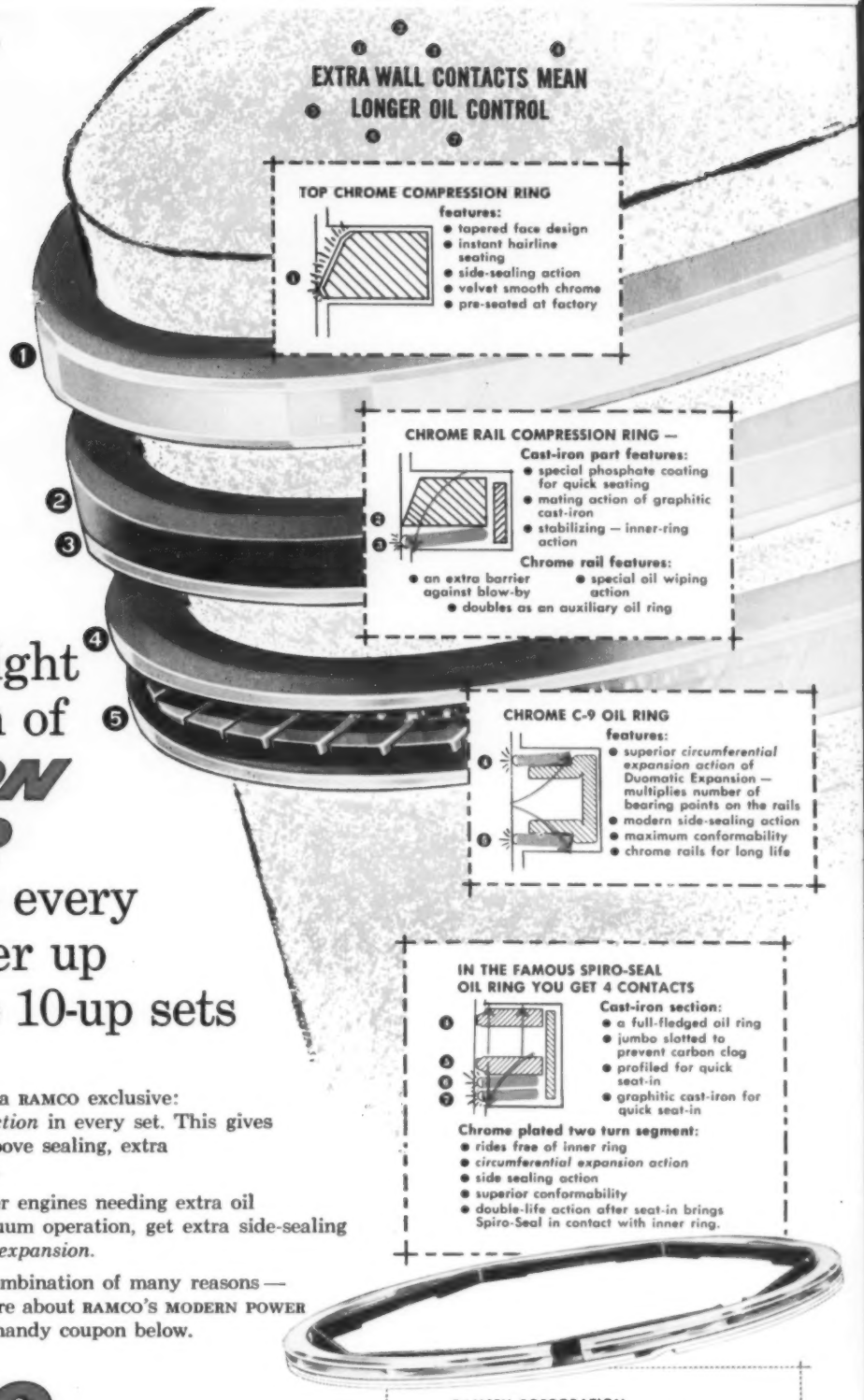
Papa Seagull returned to his nest and announced that he had just made a deposit on a new Buick.

★ ★ ★

Two first graders were standing outside school one morning. "Do you think," asked one, "that thermonuclear projectiles will pierce the heat barrier?"

"No," said the 2nd. "Once a force enters the substratosphere—"

Then the bell rang. Said the 1st: "There goes the bell. Darn it, now we gotta go in and string beads."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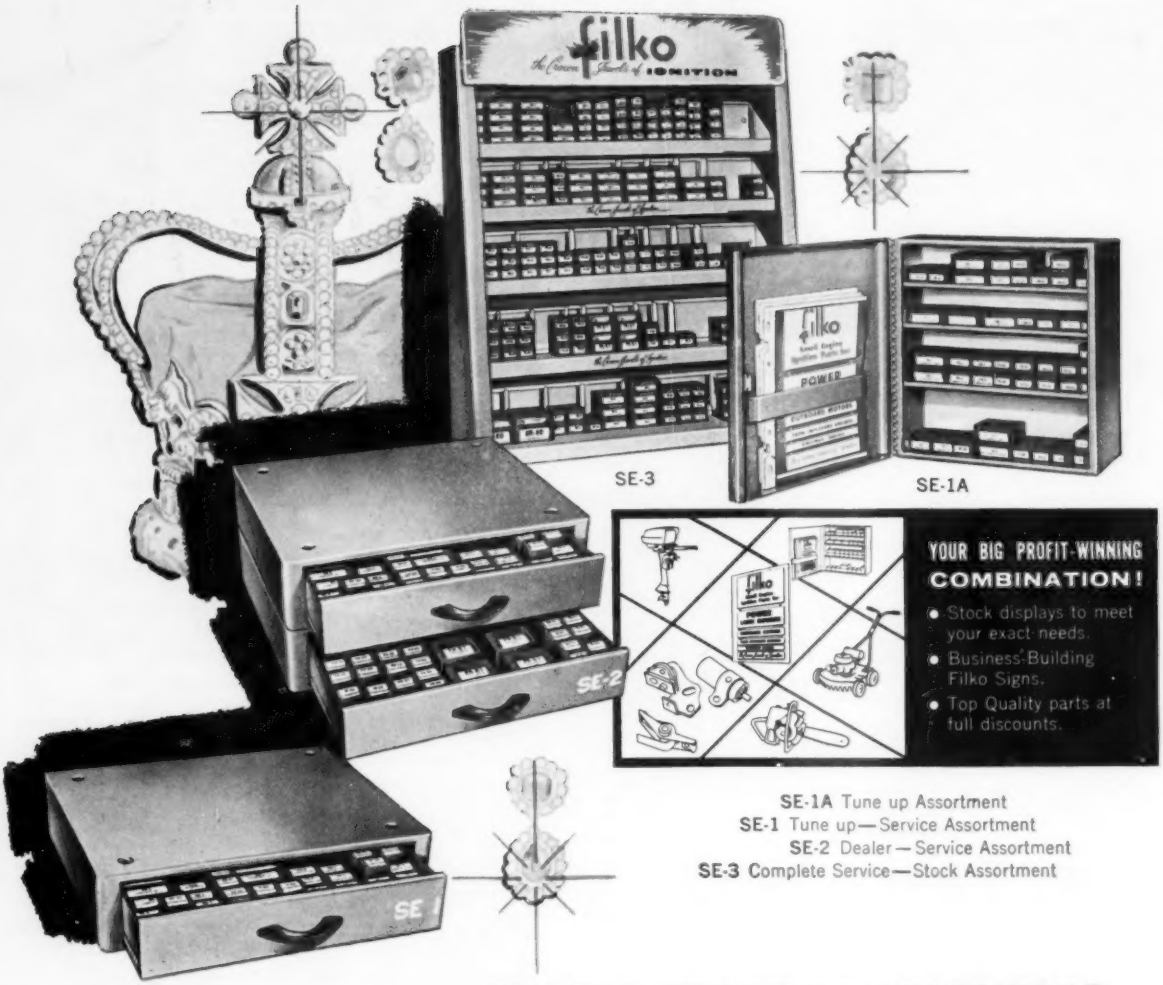

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